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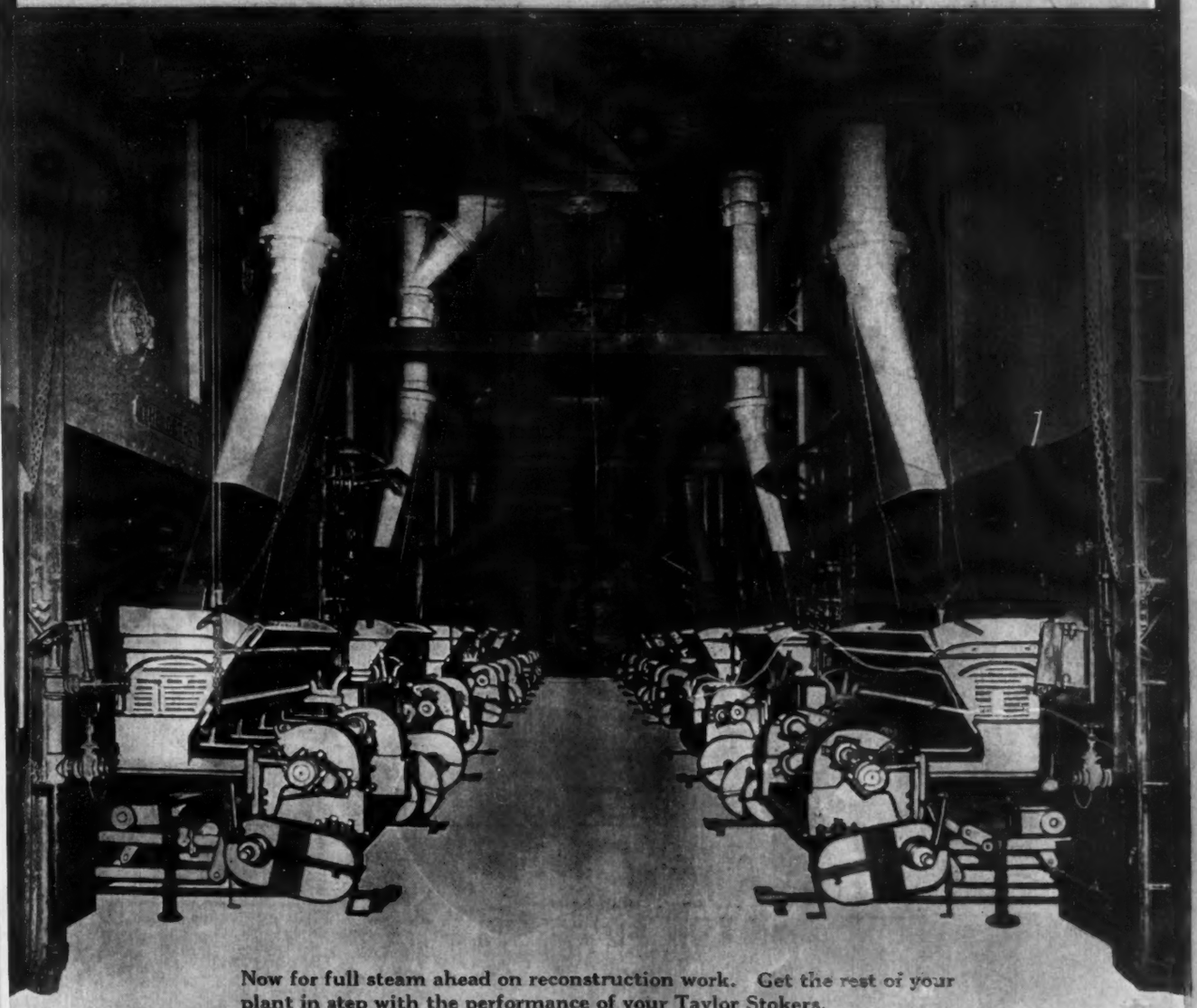

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

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Power Factor in Rates

CONSIDERABLE information has been given in our columns recently on the subject of power factor and on the methods of ascertaining it. Of course, if the power factor is to enter as such into customers' bills it is obviously necessary to get a pretty clear idea of what it is. Perhaps the commonest device thus far is the use of a graphic meter recording power factor, a device somewhat expensive and not always telling all that it is desirable to know, but yet fairly reliable and well enough adapted to rather large consumers. For general purposes of power-factor measurement, however, the situation is not so favorable, and, as we recently suggested, there is some doubt whether power-factor measurement is not a somewhat indirect method of getting at the kva. record. A meter for kilovolt-ampere-hours ought not to be at all a difficult proposition, and certainly an ampere-hour meter would come as near giving a fair average of the situation as any ordinary method of measuring the power factor and then combining this information with that delivered by the ordinary watt-hour meter. A somewhat rough-and-ready periodic power-factor test involves averaging one of the desired factors just as an ampere-hour meter would average another, and year in and year out the two schemes would probably be nearly on all fours. At all events, the time has come when more attention should be paid to this particular problem in metering, for with the rapidly increasing use of motors the situation is steadily growing more unsatisfactory.

Water-power resources are being roll-called for incoming legislatures, and popular interest in real conservation through development of plant and storage facilities is rising fast. Obstructive tactics by politicians cannot dam meritorious projects much longer.

The American Engineer Abroad

BLESSINGS in disguise are not always what they are cracked up to be. That is to say, benefits contingent on previous disasters do not always outweigh them at once or in the near future. Ultimately they may do so, the remoteness of the period being in exact ratio with the gravity of the disaster. In those sections of Europe devastated by the war, for example, it will be generations before the wounds of battle and invasion are healed and the scars forgotten. None the less, the healing will be hastened and the smart assuaged if on the ruins of the old order a better can be reared. Just as flood, fire and earthquake brought respectively a greater Galveston, a better Baltimore and a more splendid San Francisco, so the destruction of war should clear the way for progress in those trampled regions where conservatism formerly held sway.

Here surely is a chance for the American engineer abroad. Where factories have been destroyed, railroads torn up, transmission lines put out of business, machinery converted into junk, every consideration calls for the replacement of the ruined equipment with the best that modern practice can supply. Moreover, the opportunities for improvement and extension of still existing utilities and for starting public works where none have been before will be abundant. Particularly in the electrical field, where—in France and Italy, for instance—great water powers can be made to drive hundreds of industrial plants and illuminate thousands of homes, are the possibilities alluring. The day will come when the European farmer, like his American brother, will demand his electric car, his telephone connection and a tap line from the nearest transmission system to his farmyard and his residence. In the near future all over the civilized world tungsten must replace tallow and invisible energy supplement human exertion. Abroad as well as at home the electrical engineers of the United States have their part to play in speeding the coming day.

The delivery of night letters by mail carriers is a step backward, and the telephone should again be the last link in the time-saving mechanism formerly embodied in this service. Public opinion can compel a return to the efficient service of the past, which ought to be restored at once.

Electric Power in the Antipodes

THE great transmission plant for supplying the growing industrial needs of Tasmania, described in this issue by L. W. Alwyn-Schmidt, gives occasion for strenuous thinking. The average American, if he considers Australia at all, remembers it as a big island somewhere diametrically through the earth from us, or as the abiding place of a ferocious and hard-fighting tribe of Anzacs whom the Hun has learned to detest and fear. To settle down to the realization that it is a continent nearly as big as the United States with a growing population as hustling and independent as our own is an eye-opener to him. Tasmania, that outrider of Australia, is roughly the size of the State of Maine. When Mr. Schmidt casually mentions that a zinc-producing company in Hobart has taken 4000 hp. of transmitted power with an option on 26,000 hp. more one begins to recognize the possibilities of our antipodal kinsfolk.

The plant just completed has its source of supply in

a lake far among the mountains of the interior, at a level near that of the top of the Adirondacks, where a storage of 50 square miles (260 hectares) has been impounded, sufficient to produce a minimum supply of 70,000 hp. Not the whole of the available head is yet utilized, but the water is taken from the storage lake to a reservoir, whence it drops through the pipe lines over 1100 feet (335 m.) to the power house. The house itself is of corrugated iron on a firmly set steel framework and is divided into two sections, one for the transformers, the other for the generating sets. These latter are at present three in number, of about 5000 hp. each. Power is generated at 6600 volts and stepped up to 88,000 volts for transmission. The transmission line to Hobart is 77.5 miles (124.5 km.) long, though there is an extension of a single circuit 14 miles (22.5 km.) further, and is of the lattice-steel tower type with two three-phase circuits of stranded wire and a grounded cable over all. The receiving station in Hobart is already being doubled in capacity by the addition of a 4000-kva. outdoor substation, and besides the zinc works already referred to, a carbide plant has contracted for 3500 hp. with an option on 6500 hp. more.

This ready access to a large power supply gives a fine opportunity for other enterprises besides the group of comparatively small ones already under way. No small part of the interesting equipment was derived from American sources, English competition being eliminated by war conditions.

Increased consumption of energy for lighting is helping the central station to offset in part the reduction in revenue accompanying the curtailment of war-plant power service. Lengthening days, however, are with us, and the time is ripe for intensive efficiency work in motor applications that save fuel, reduce maintenance cost and cut the expense of executive supervision.

Lessons of a Receivership

IT REQUIRES no particular virtue or wisdom to hammer a company that has just gone into receivership. The Brooklyn Rapid Transit Company was hammered all the way in, and it will likely be hammered for some time to come by those who do not care whether or not they display virtue or wisdom in so doing. We are not here to hammer. It is not a company connected with the central-station industry, but it is one of the several classes of public utilities, and as such its downfall is open to us to draw lessons from. In so doing we may be pardoned if we remind our readers again that conditions in the central-station industry are widely dissimilar from those in the electric railway industry. We do not mean merely the outward conditions, open to him who sees only the surface, but the underlying, the foundation principles of management and methods. You see this difference in such matters as the rate making, the growth of "wholesaling" of power in one industry contrasted with the retailing of single rides in the other, the steady extension of electric service year by year as against, especially in this instance, a great policy of expansion involving hundreds of millions of dollars and transit provisions for say twenty-five or fifty years. But these differences aside for the moment, we claim an interest in the fortunes of the electric railways as of the steam railroads because all utilities operate under somewhat similar laws, they are bound together by many ties of common ownership, they are vitally concerned in the issue of public ownership, of regulation.

Therefore we look to the Brooklyn Rapid Transit Company receivership to see what lessons it carries for the central stations which are seeking to preserve good relations, to maintain good service, to keep the treasury supplied with capital in order that needs for plant enlargement and extension may be met. It appears to us that the first lesson is the danger of staking the financial integrity of the property on a single rigid contract; the second lesson is the danger and weakness of the uniform rate of fare. The contract in this particular case was the franchise arrangement with New York City for a vast construction program, a dual plan whereby the city advanced enormous sums to assist in meeting the capital requirements. The contract was one that the city wanted; it was one that the company wanted. What happened is that the war enhanced costs, delayed construction progress, tied up capital without chance of return. Is a public utility so nearly infallible that it can afford not to protect itself by some such safeguard as the manufacturer uses, to the limits of its practicability in a competitive business, when he makes performance contingent upon the absence of untoward events? It is easy to argue in answer that the war will not occur again. But who will be so rash as to say that in the life of a long contract like the one in this case nothing will ever happen again that will cause distortion? Likewise, with the uniform rate of fare a company in effect gambles that there will be enough short riders to offset the long riders and provide a surplus profit. If, on top of this, there is no ready means for changing the rate of fare—down or up as conditions may justify—the hazard of the speculation is increased.

Now for the moral. So far as we are informed, there is no municipal contract in the central-station industry comparable with that providing for new transit lines in New York, nor is it likely that so extensive a program of construction would be necessary in a central-station property serving a single community. There are, however, existing contracts under which central stations furnish a material proportion of their output of power for the electric railway system of the community. Probably in the future we shall see many similar contracts under which central-station energy will be supplied for railroad trunk-line operation. In these contracts it is of great importance that the factor of revolutionary change in conditions shall be kept in mind. Change may mean up or down, but the lessening of the element of chance in this era of regulated profits is more likely to benefit than to harm the central station. Fortunately the central-station industry does not have to deal with the uniform rate. With a uniform rate the central-station industry, in our opinion, would never have reached the enormous size of to-day. But there is an element of danger in uniformity of rate by contract for different classes of consumers. The risk in this can and should be dissipated by introduction of coal clauses. And it may be advisable in the future to introduce variables to correct also fluctuating labor costs.

The Use of Very Large Units

ONE of the striking characteristics of recent station design has been the increasing use of big generating units, often up to 20,000 kw. or 30,000 kw. and sometimes larger. In any electric supply system the size of the individual unit should bear some clear relation to the total load and to its fluctuations through the day. On the one hand, it does not pay to put too many eggs in one basket; on the other, there is a material disadvantage in an unnecessary multiplicity of units. The fundamental thing in a system is that there should be enough reserve supply so that no contingency reasonably to be expected can materially interfere with the output so far as the generating stations are concerned.

Thus it happens in the great transmission networks that by a proper system of load dispatching some stations may go out of action entirely at particular periods, leaving the load for others while surplus of water is accumulating, and the number of units per station is determined by local conditions rather than by any consideration of individual operation. In steam-driven systems this same general principle cannot be pushed quite so far, but the present tendency is working rather against the gigantic consolidated station and in favor of splitting the total capacity into two or more groups adapted to deal somewhat more advantageously with the total distribution of load in the network. Under these circumstances big turbo-generators can be applied to great advantage, the total output being dealt with as a whole irrespective of the particular situations in which it has proved wise for various reasons to install the generating units.

The cost of service must be met by the public at large if the people insist on having particular facilities which cannot be provided out of rates. It is for the public to decide what service it desires. Shutting down utilities which do not pay is a serious affair for states as well as for localities, and before the junk man is called in there should be no hesitation in making the taxation alternative plain.

Bettering the Steam Plant

THESE are times when every electrical supply station is hard up against the question of the efficient use of fuel and the improvement of its station practice all along the line. However optimistically one may forecast the general future of the business, one thing is certain, that pre-war fuel prices will be very slow in returning. Never is a long time; but it will take a very protracted period to recover from the effects of the inflation brought about by the war. Whether one wishes to burn fuel oil or coal the case is about the same—shortage in the general supply, enormously increased cost of labor and an added burden of transportation. In the long run the necessity of scientific economy replacing methods in many cases of almost unexampled wastefulness may prove to be a blessing in disguise, although the average station manager nowadays considers the disguise altogether unpleasantly effective. W. A. Shoudy, in last week's issue, very properly laid emphasis on the fact that there is no royal road to fuel economy. The operation of the prime movers with the minimum waste measured in B.t.u. is a thing which demands very close attention to detail, as well as generally correct lines of procedure.

As regards the electrical end of the equipment there is very little to hope for in the way of direct saving. The working efficiency of first-class modern generators is so high that gain by improvement here, so far as operating costs go, is rather insignificant. One must look back of the generator for his improvements. The three maxims which Mr. Shoudy lays down are, first, to keep the vacuum up; second, to carry no more idle boilers than are absolutely necessary, and, third, to look out for small wastes. To some of these latter we not long ago had occasion to refer, especially the very considerable losses that may come from improperly insulated or uninsulated steam pipes, which are a type of the lesser sources of loss. Most stations are fairly careful about carrying idle boilers. A certain amount of this has to be done as a protection against accident and suddenly varying loads. Perhaps the very fact that there is risk in too small a margin of available boilers tends to laxness. When a station is suddenly called upon at midday, as was one big plant not long ago, for load increasing at the rate of 1000 kw. a minute, it would be in a bad way indeed if it had been cutting too close to the limit of boiler capacity. The vacuum matter strikes us as being of extreme importance. The last-minute fractions of possible vacuum make a rather startling difference in steam-turbine performance, and while under favorable circumstances it may not be advisable always to install turbines planned for the highest possible vacuum, it is certainly true that, given a particular equipment of prime movers, the higher the vacuum can be kept the better. This implies very close attention to the auxiliaries, minute watching of temperatures, constant outlook for anything that may bring the vacuum gage below its appointed stage.

Steam pressure is generally fairly well kept up to standard, albeit that standard is very frequently lower than progressive engineering would indicate. We have for a long time preached high steam pressures, and slowly they are on the way; but a good vacuum well maintained will make up, temporarily at least, for ultra-conservatism in the steam pressure. The same in lesser degree is true of superheat. We have been very timid in this country in taking up degrees of superheat long in successful use elsewhere. While reciprocating engines were commonly in use it was well-nigh impossible to get a favorable response to specifications calling for anything above the most modest degree of superheat, and with the coming of the turbine the same conservatism stood in the way of progress. Most superheaters in this country are built into the boiler instead of being independently fired. This makes the superheat in large measure dependent on the rate at which the boiler is forced, and thus high superheat may mean a certain reduction in boiler efficiency. Data on the comparative performance of prime movers with modest superheat in the boilers and with high superheat outside of them are scarce; yet the fact that the latter has been fairly common outside of our own country would indicate that its merits should be very thoroughly considered in these days of big turbine units. In new plants all these things can be looked after. In old ones it is not so easy to push economies to their legitimate conclusion. One can always, however, watch out for the small losses.

Engineering Aspects of Industrial Lighting—I

Industries Should Take Advantage of Studies Made Under Stress of War Conditions to Promote Efficiency of Production—Specific Data Now Available Which Aid in the Selection and Location of Lighting Units

BY C. E. CLEWELL
Assistant Professor of Electrical Engineering, University of Pennsylvania

THE extreme conditions which have just been experienced under stress of war have been the cause for a careful survey of many factors affecting industrial activity. Whenever such a survey has been directed toward ways and means for increasing production and for rendering workmanship more effective through improvements in the physical environment of the industries, it is pretty safe to assume that the lessons learned under the extremities of war also contain the basis for some valuable conclusions relating to the efficiency of manufacturing methods in times of peace. In other words, the effort to obtain highly efficient results in the shortest possible time consistent with good workmanship is a topic of the most pressing importance now just as it was during the war, even if to a somewhat different degree, and it is confidently believed that many of the lessons of the past year or so of the war can be utilized in a way which will make them a potential asset not only during the reconstruction period now in evidence but beyond this into any period of more normal activity which may follow.

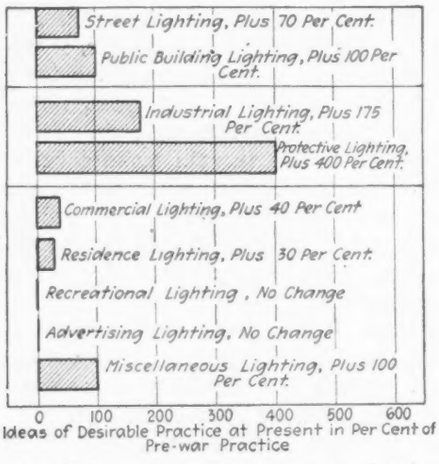
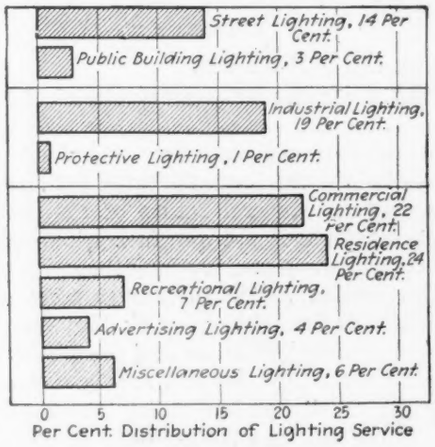

Street Lighting, Plus 70 Per Cent.
Public Building Lighting, Plus 100 Per Cent.
Industrial Lighting, Plus 175 Per Cent.
Protective Lighting, Plus 400 Per Cent.
Commercial Lighting, Plus 40 Per Cent
Residence Lighting, Plus 30 Per Cent.
Recreational Lighting, No Change
Advertising Lighting, No Change
Miscellaneous Lighting, Plus 100 Per Cent.
0 100 200 300 400 500 600
Ideas of Desirable Practice at Present in Per Cent of Pre-war Practice

FIG. 1—COMPARISON OF PRE-WAR AND WAR-TIME LIGHTING PRACTICE

During the past months, while the war was in progress and when the highest efficiency possible was imperative in the conduct of the war industries, the Employment Management Section of the War Industries Board undertook as one of its activities the preparation of instruction courses for the intensified training of employment managers falling within the province of the board. This movement was directed primarily to the training of those who were called upon to manage the employment departments of the war industries, but it doubtless also had as a secondary and almost equally important object to influence the employees through the manager, for the purpose of rendering them better satisfied to follow one given line of work during the war, and to make them individually a better and more valuable part of the organization. This procedure should reduce the excessive labor turnover which was experienced here and there, due either to voluntary transfers of workmen from one plant to another or to enforced withdrawals on account of the need of replacing inferior with more effective workmen.

Among the topics attacked by the Employment Management Section was that of natural and artificial industrial lighting, this subject having been assigned to the writer. Valuable data were collected, and a portion of the accumulated information was used by the Employment Management Section. The complete program was abridged by the ending of the war, but the files of data have been placed at the disposal of the writer. The following notes are based, in general, on these data and are published with the permission of this section of the board, with the idea that such information is likely to be of interest to the profession at this time. It is perhaps only proper to state at the outset that where ideas may be advanced regarding specific types of equipment they must be accepted by the reader as the ideas of men in the field who have endeavored in the emergency to give specific opinions as an aid to the war industries. The writer cannot, under these circumstances, be held as either favoring or differing from such ideas on specific types of equipment, and he places these opinions before the reader merely for what they may be worth.

The three installments of the series on industrial lighting have been planned so as to limit the present article to a brief review of the studies upon lighting economies during the war, with references also to current data on factors governing the choice of lamps and reflectors and simple methods which have recently


Street Lighting, 14 Per Cent.
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Commercial Lighting, 22 Per Cent.
Residence Lighting, 24 Per Cent.
Recreational Lighting, 7 Per Cent.
Advertising Lighting, 4 Per Cent.
Miscellaneous Lighting, 6 Per Cent.
0 5 10 15 20 25 30
Per Cent Distribution of Lighting Service

FIG. 2—RELATIVE PROPORTION OF DIFFERENT CLASSES OF LIGHTING SERVICE

been advanced for deciding upon spacing and lamp sizes. The second installment is to cover the subject from the standpoint of economies produced by good lighting and its effect on accident prevention, while the third is to relate chiefly to examples of lighting systems in the field.

One of the most instructive surveys of the whole question of lighting curtailment during the war was that contained in a paper by Preston S. Millar.[1] This paper contains much information which might be studied with profit irrespective of its relations to the war, but in this case, as in many others, the stimulus for an intensified study into curtailments of lighting was largely, if not

[1] *Transactions* Illuminating Engineering Society, Vol. XIII, No. 2, March 20, 1918.

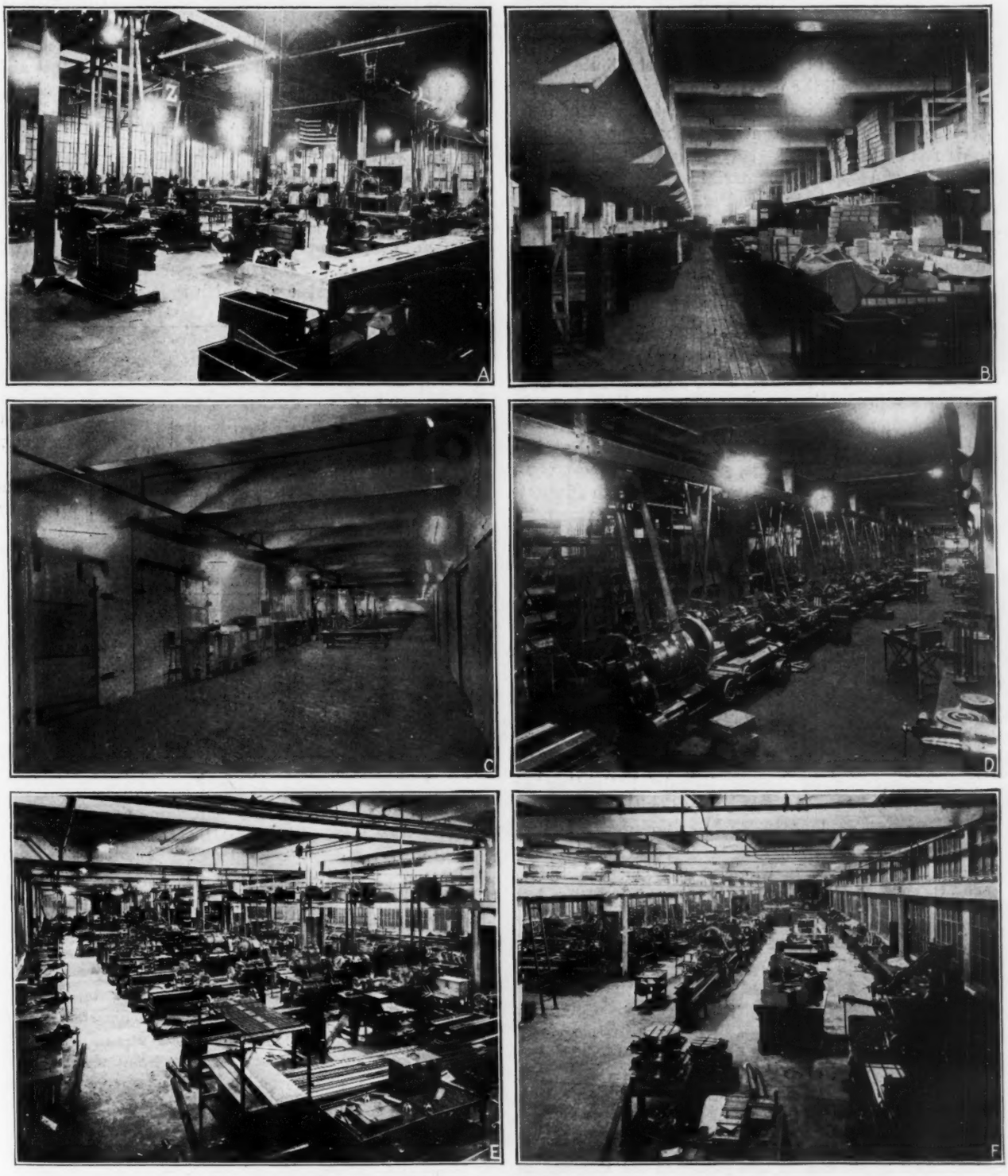


FIG. 3—VARIOUS METHODS OF INDUSTRIAL LIGHTING NOW FOLLOWED

A—Lighting installation in works of the Domestic Engineering Company, showing the use of "Reflecto-Cap-Diffuser" Mazda units. B—Stock-room lighted with 200-watt Mazda type C lamps and dome steel reflectors; the units are 10 ft. above floor and 16 ft. apart. C—View of the body-finishing department in the Studebaker automobile plant illuminated by Cooper Hewitt mercury-vapor lamps. D—Mercury-vapor lighting system in a machine shop section of Dodge Brothers' automobile plant. E—Type P mercury-vapor lamps on 15-ft. by 20-ft. centers in a tool room of the Cincinnati Milling Machine Company; the average consumption in this space is 1.3 watts per square foot. F—Machine-shop section illuminated by mercury-vapor lamps; note the excellent bench surface lighting to the right and the absence of drop lamps on individual machines.

wholly, due to war conditions. Its interest at this time lies in some of the conclusions reached under pressure of the war emergency.

Mr. Millar's summary of the views of representative engineers on the adequacy of standards of lighting practice, as plotted graphically in Fig. 1, indicates a marked tendency to view the practice in the industries as very inadequate early in 1918. This was perhaps a natural conclusion because of the urgency of war work in this country, and lighting men were most likely to feel in all cases that good light could be made to contribute greatly to the success of all the pressing industrial efforts. The common opinion, indicated in Fig. 1, in favor of great increase in protective lighting is based on apparent needs felt at the time.

Figs. 2 and 4, also summarized from tables in Mr. Millar's paper, indicate (in Fig. 2) the approximate magnitude of the various principal classes of lighting service and show that industrial lighting holds an important place in the lighting field as a whole. The adjustments thought to be desirable in lighting practice early in 1918 are pictured in Fig. 4, and here again the industrial field is the only one where general opinion favored marked increases rather than curtailment.

These three charts point strongly to the importance of lighting to production, and, moreover, they may be taken to indicate that what was thought to be essential as a war measure in the form of increases in lighting, in spite of the fuel shortage, points with almost equal force to the needs of more careful attention to adequate standards of industrial lighting now that the war pressure is past. The interesting and timely fact brought home by this paper and by the data compiled by Mr. Millar is not so much the general consensus of opinion that the quantities of industrial lighting could advantageously go up rather than down in the face of an extreme fuel shortage, but that a study of the situation at such a time, and with public opinion so completely centered upon fuel saving as a war measure, should bring results showing that industrial lighting fell below desirable values the country over and ought to be increased for the good of the war.

The importance of better industrial lighting as brought to a head by the Millar paper, with its clear-cut possibilities of application during the present reconstruction period, need not be a cause for completely overlooking the ways in which actual and not virtual economies may be effected at all times. Mr. Millar has indicated that these fall in a general way under five heads which are listed as (a) avoidance of inefficient lamps, (b) avoidance of improper reflecting or diffusing equipment, (c) avoidance of faulty locations for the lamps, (d) careful maintenance, and (e) the prevention of wasteful burning of lamps. Economy in the use of light by these means is not to be confused in any sense with the bringing up of lighting values in the factory to a point where the maximum production, as far as it can be influenced by good light, is obtained.[2]

Information soon to be published by the Industrial Commission of Wisconsin and placed at the disposal of the Employment Management Section of the War Industries Board for public use in advance gives promise of some valuable new suggestions in the practical planning of factory lighting systems. These are mentioned briefly at this time because of the need which has been felt during the last few years for simple rules as an accompaniment for state factory lighting codes.

These notes of the Wisconsin commission appear to answer the question in a large measure by giving specific rather than general data on such questions as the determination of mounting heights and spacing distances for lamps under factory conditions, the sizes of lamps and the types of reflectors or globes to employ. In aiding the practical factory engineer thus not only to decide on the quantities of artificial illumination to use but also on the ways and means by which to secure desired results, the Wisconsin commission takes a step well in advance and contributes actively to the cause of better-lighted industries.

Special comment is directed in this connection to two charts prepared especially for the commission by Arthur J. Sweet of Milwaukee, by which it is proposed to give

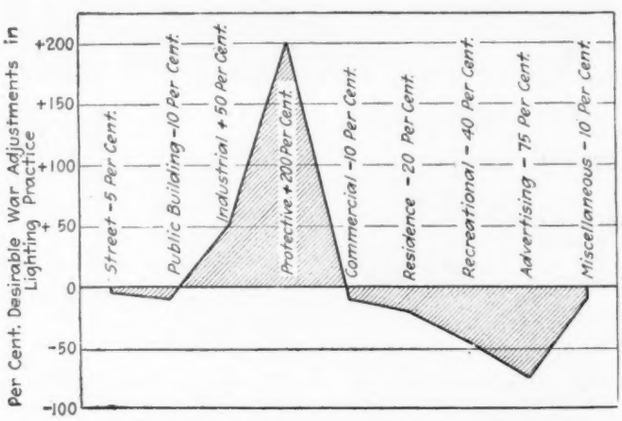


FIG. 4—DESIRABLE ADJUSTMENTS IN VARIOUS CLASSES OF LIGHTING DUE TO THE WAR AND TO FUEL SHORTAGE

the practical factory departments a basis for selecting spacing distances and lamp sizes (both gas and electric) for a given ceiling height. The selection of auxiliary equipment for the lamps is aided by a table classifying or rating the shallow-bowl porcelain-enameled metal reflector, the deep-bowl porcelain-enameled metal reflector, the deep-bowl mirrored glass, the shallow-bowl porcelain-enameled reflector with a shield or cap fitted to the lamp, and the special prismatic glass industrial unit of the deep-bowl type, in terms of the following characteristics: (a) Efficiency with respect to horizontal illumination, (b) efficiency with respect to vertical illumination, (c) ease of maintenance, (d) non-liability to breakage, (e) non-liability to deterioration other than breakage, and (f) the relative avoidance of characteristics producing eye-strain.[3] Somewhat similar data (Table I) are herewith included from the data of Ward Harrison,[4] although the types of reflector equipment are not identical in the two cases.

The advantages of ready methods for the selection of lamp and reflector sizes have been apparent during

[2]Those interested in this subject are referred to Mr. Millar's paper in the *Transactions* of the Illuminating Engineering Society and also to the report on war-time lighting economies by the committee on war service of the Illuminating Engineering Society, made public Oct. 10, 1918. Mr. Millar was chairman of this committee.

[3]The two charts referred to above in the notes of the Wisconsin Industrial Commission, while submitted for publication to the War Industries Board, have not, as far as the writer is aware, been published by the Wisconsin commission as yet, and hence are not included at this time as part of this article.

[4]*Transactions* Illuminating Engineering Society, Vol. XII, No. 8, Nov. 20, 1917.

the past months, and such simple rules will doubtless continue to be in demand indefinitely owing to the lack of training of those so often called upon to plan such systems. Table II contains suggestive information along these lines.[5]

TABLE I—FOR SELECTION OF FACTORY LIGHTING UNITS

	Dome Reflector, Clear Lamp	Bowl Reflector, Clear Lamp	Dome Reflector, Frosted Lamp	Dome Reflector, Opal Cup	Dome Reflector, Mirror Cap	Opal Globe with Reflector
Per cent clear lamp lumens — Total				68		70
lower hemisphere	77	66	72	66	58	57
Relative horizontal illumination	100	91	95	85	84	71
Relative vertical illumination	A	C	A	A	B	A
Direct glare	D	C	B	B+	A	B
Reflected glare	D	D	C+	B	A	B+
Shadows	C	D	B	B+	A	B+
Maintenance	A	A	B	D	C	C

A word of caution, similar to other comments which the writer has made upon such short-cut rules in the past, is perhaps in place. Discussion with factory architects shows a tendency to adopt some simple rule applicable to the typical factory section. Such a remark as "We place lamps in factories on so and so many feet centers and find they are satisfactory" leads those who have gone through innumerable difficulties in arriving at this same choice in given factory locations to view with some misgivings the attempt to reduce all cases to too hard and fast a rule. There are often peculiar circumstances which impose restrictions upon the set rule, and to safeguard against errors in such cases judgment should always be applied to rules or methods such as those just referred to. With a suitable element of judgment in the interpretation of such ready methods, they constitute a valuable addition to the available means at hand for planning out the industrial lighting system.

Fig. 3A, due to the Ivanhoe Regent Works of the General Electric Company; Fig. 3B, to the Edison Lamp Works of the same company, and Figs. 3C, 3D, 3E and 3F, to the Cooper Hewitt Electric Company, are included in the present article as representative views of successful installations submitted to the Employment Management Section of the War Industries Board for its educational activities.

[5]Found in Catalog 276, Invanhoe-Regent Works of General Electric Company, issued Aug. 15, 1918.

TABLE II—INTENSITIES IN FOOT-CANDLES RECOMMENDED FOR VARIOUS MANUFACTURING OPERATIONS, AND CORRESPONDING WATTS PER SQUARE FOOT REQUIRED WITH DIFFERENT TYPES OF REFLECTORS

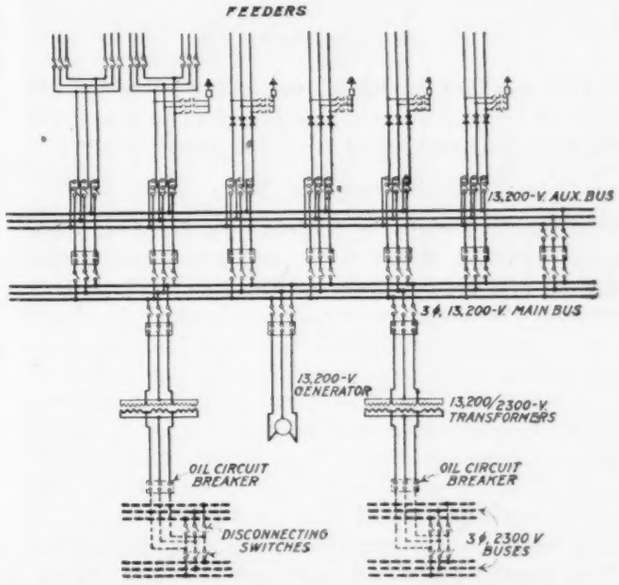
Class of Work*	Foot-Candles	Watts per Square Foot Large Room†	Small Room†	Type of Reflector and Lamp
For rough manufacturing occupations, such as rough assembling, rough forging, rough woodworking, ice making potteries, lumber mills, tanneries, etc.	2-4	0.37	0.55	Dome type with clear lamp
		0.40	0.60	Dome type with bowl frosted lamp
		0.40	0.68	Bowl type with clear lamp
		0.43	0.65	Dome type with opal lamp
For medium manufacturing occupations, such as medium woodworking, rough machining, rough bench work, automatic machine work, meat packing, paper making, laundries, bakeries, etc.	3-5	0.56	0.95	Dome type with clear lamp
		0.60	1.00	Dome type with bowl frosted lamp
		0.65	1.05	Dome type with opal cap
		0.70	1.10	Bowl type with clear lamp
		0.75	1.20	Reflecto-cap diffuser
For fine manufacturing occupations, such as fine assembling, leather working, fine woodworking, fine lathe work, tobacco manufacturing, fine sheet metal working, manufacturing light-colored textiles, etc.	4-8	0.95	1.70	Dome type with clear lamp
		1.00	1.80	Dome type with bowl frosted lamp
		1.05	1.90	Dome type with opal cap
		1.10	2.00	Bowl type with clear lamp
		1.20	2.15	Reflecto-cap diffuser
For extra fine manufacturing occupations, such as: watch and jewelry manufacturing, engraving, type setting, shoe manufacturing, enameling, manufacturing, dark-colored textile, etc.	7 and upward	1.4	2.3	Dome type with clear lamp
		1.5	2.5	Dome type with bowl frosted lamp
		1.6	2.7	Dome type with opal cap
		1.7	2.8	Bowl type with clear lamp
		1.8	3.0	Reflecto-cap diffuser

*The "reflecto-cap diffuser" is not recommended for installations where the polished cap is exposed to destroying elements.
†Rooms are considered large when their width is five times their height; rooms are considered small when the width and height are equal. Rooms intermediate in proportion require proportionate intermediate values of watts per square foot.

LAYOUT FOR A STATION WITH TWO BUS POTENTIALS

Details of Plan Which Permits Taking Advantage Not Only of Diversity of Loads but Also of Economical Combination of Generating Units

Engineers who are operating two separate bus systems at different voltages and those who have separate two-phase and three-phase buses may find points of interest in the diagram of connections which was worked



WIRING PLAN TAKING ADVANTAGE OF ALL DIVERSITY

out to meet a similar condition for the central station at Peoria, Ill. The plant supplies loads at 2300 volts and at 13,200 volts, and it has both 13,200-volt and 2300-volt generators. The connections shown in the diagram allow the plant to take advantage of the diversity between both classes of load and permit the operation of any combination of generators which may be desirable.

In general the plan consists of placing between the two sets of double buses two banks of 4500-kva., 13,200/2300-volt transfer transformers. To give further flexibility on the 13,200-volt system a combination of oil and disconnecting switches has been worked out which will permit any oil switch to be isolated.

Getting Better Combustion of Indiana Coals

Description of Practical Methods by Means of Which Furnace Equipment Installed Years Ago Can Be Modified in Such a Way as to Produce Results Comparable with What Is Considered Good Modern Practice

BY T. A. MARSH
Chief Engineer Green Engineering Company

INDIANA is the fifth state in importance as regards tonnage of coal produced. With coal-producing states on either side, the coals of Indiana have not until recently had the wide distribution now existing. Indiana coal is used in many cases where its characteristics are somewhat unknown and where the existing furnaces are unsuitable for its use. Many plants reached either by West Virginia, Kentucky, Ohio or Indiana coals have

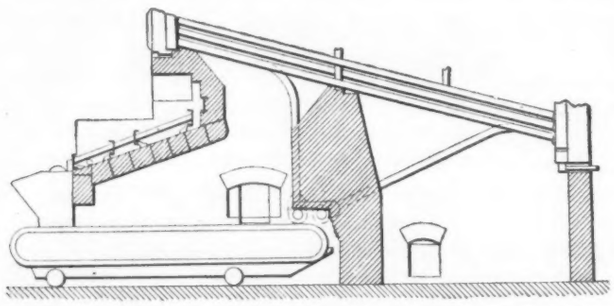


FIG. 1—TYPICAL CHAIN-GRATE SETTING UNDER VERTICALLY BAFFLED WATER-TUBE BOILER

no adequate provision for the use of the latter and are unable to get satisfactory results unless they use the higher grade of coals from the three former states.

THE CHOICE OF COALS

The standard coals in Indiana are found in four seams, Nos. 3, 4, 5 and 6. In addition a few special grades of coal are produced, but these do not come in a class with steam coals with which this paper deals and therefore are not considered. Steam-production engineers are interested almost entirely in the quality of the screenings. The table below gives the proximate analyses, heating values and sulphur content of typical screenings from the four Indiana seams. These analyses cannot be compared on an equal basis with samples of coal as usually submitted, because such samples are usually based on run-of-mine or lump coal. Screenings contain usually 4 per cent more ash than run-of-mine coal and approximately 6 per cent more ash than lump samples. Naturally the screenings are correspondingly lower in heating value. Screenings are the natural steam coal. Therefore it is on the screening analyses and values that conclusions should be based.

INDIANA SCREENINGS

	No. 3 Seam	No. 4 Seam	No. 5 Seam	No. 6 Seam
Moisture, per cent	10.8	12.4	10.1	11.0
Volatile matter, per cent	35.00	33.2	33.2	31.1
Fixed carbon, per cent	36.9	44.2	42.0	41.5
Ash, per cent	17.3	10.2	14.7	16.4
B.t.u. (commercial)	10,400	11,069	10,820	10,540
B.t.u. (dry basis)	11,670	12,610	12,039	11,730
Sulphur, per cent	4.55	1.75	4.27	3.50

The characteristics of the coal from the various seams are as follows:

No. 3 coal, while not high in heat value, has the highest percentage of volatile matter and therefore gives up its heat more quickly than No. 4, No. 5 or No. 6 in a furnace. It is an excellent coal to use for capacity in furnaces which are limited as to ignition arches or draft or both of these. The structure of the coal is soft, and it therefore disintegrates readily and is not good for storage coal. Its relatively high percentage of sulphur further complicates the storage problem, and the fusibility of the ash causes excessive clinker when the fuel bed is agitated. The tonnage of No. 3 coal produced is not large and the distribution is therefore limited.

No. 4 coal from commercial standpoints has the greatest utility of all Indiana coals. Its heating value is relatively high for a Western coal. Its sulphur content is low and the coal in this seam is of very uniform quality. The fixed carbon is of such good structure that this coal when used in by-product ovens makes excellent coke. Owing to the uniformity of No. 4 coal and its low sulphur content, it is in great demand at all times for special-process work, such as forge and heating furnaces, and commands a higher price than other Indiana coals. It is better adapted for stoker use than the other fuels mentioned, and this applies particularly to its use on stokers that agitate the fuel bed. With fireclay above and below a large portion of this coal seam the clinker produced is of a brittle "pottery" nature. In fact, many plants having clinker trouble are limited to the better grades of No. 4 coal. This is an expensive limitation, but is frequently a necessary one to obtain continuous operation, which is not possible with coals having a higher percentage of ash and a greater tendency for making clinker, due to lower fusing temperature of the ash.

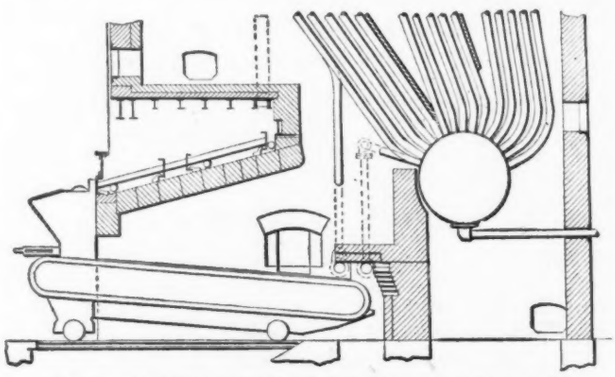


FIG. 2—MODERN FURNACE SERVING STIRLING BOILER

From the standpoint of steam production No. 5 coal is the most important of the Indiana coals. Its high

percentage of sulphur makes it unsuitable for special-process work, but on account of the large quantity produced and assurance of supply, together with its uniformity and free-burning characteristics, it is recommended for steam power plants. The No. 5 coal burns more rapidly than No. 4 coal, inasmuch as the fixed carbon does not have the structure found in the No. 4 coal. Because of the low fusing temperature of the ash No. 5 coal is not readily handled if the fuel bed is agitated. A considerable portion of this seam has rock above and

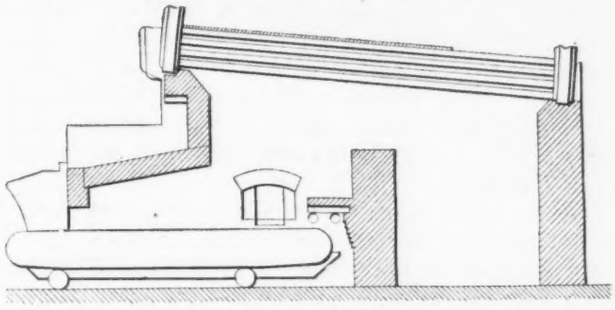


FIG. 3—CHAIN GRATE UNDER HORIZONTALLY BAFFLED BOILER

below so that there is no clay mixture to keep the clinker brittle, and although the coal is clean as regards earthy matter, the clinker produced is very vitreous. This coal is entirely suitable for chain grates, but the furnace design must be such as to give a good strong ignition, a point which in many instances in the past has been overlooked.

A higher percentage of ash than in any extensively used Indiana coal is found in No. 6 coal. Its moisture is slightly less than that of the No. 4 coal, and the heating value is approximately 5 per cent less, owing to the higher ash. The ash fuses at a low temperature, making it difficult to handle. Unless the proper type of stoker is used this coal should not be considered because of the large amount of clinker produced and its vitreous structure. No. 6 coal is still more limited in its use than No. 5 owing to the lower heating value and the greater amount of clinker produced. This coal is almost entirely limited to use on chain grates, and liberal grate areas must be provided together with long arches to provide ample ignition in order to get good steaming capacity from this coal with its relatively low heating value.

For the sake of economy in the purchasing of coal and in power-plant operation, plants tributary to Indiana coals should be able to burn coal from the four seams of Indiana and should particularly be able to handle coal from the No. 5 and No. 6 seams.

THE DESIGN OF FURNACES

The design of furnaces for these coals must be given the most careful thought. Many furnaces have been inadequate, owing in the main to lack of knowledge of the coal and of the proper furnace design necessary. Large grate surfaces should be provided, as these coals are relatively inert and even with high combustion rates the ratings obtained are not high unless the grate surfaces are large. Four things must be considered in the design of furnaces for such coals as Indiana Nos. 3, 4, 5 and 6, as follows:

Ample draft must be provided. These coals can be burned at combustion rates of 40 lb. to 45 lb. per square foot (19.5 gm. per sq. cm.) of grate surface per hour with a draft of 0.40 in. to 0.50 in. in the furnace. Long, high-pitched igniting arches should be provided. Grate areas should be liberal with coals so low in heating value. If high capacities are to be obtained, grate areas should be provided having a ratio surface to the heating surface of 1 to 40 or even larger. Furnace volumes should be large. In furnaces where 40 lb. of coal per square foot of grate surface per hour is to be burned, the furnace chamber should have a volume of 12 cu.ft. (0.33 cu.m.) per square foot of grate area. Furnaces even larger are desirable.

Large grates are an advantage, as they permit ratings as high as 200 per cent and upward with high efficiencies. A characteristic of chain grates seldom emphasized, but well known to combustion engineers, is the high efficiencies that can be obtained at ratings below normal. Some stokers cannot be operated appreciably below 100 per cent rating, owing to overheating, back draft or other difficulties. Still other types operate without trouble at low ratings, but with reduced efficiencies.

Chain grates reach excellent efficiencies at from 50 per cent to 75 per cent rating. With inferior coals, therefore, large grates should be installed as this will insure high ratings when desired and will also give high efficiencies at lower ratings.

Unfortunately, many of the chain-grate installations do not have these characteristics, and capacities and efficiencies are consequently limited. Modern settings, however, give combined efficiencies of from 70 per cent to 75 per cent when burning any one of the coals under discussion and develop boiler ratings of 200 per cent and over. With chain grates these coals are handled indiscriminately. There is no clinker formation, as the ash forms on the lower side of the fuel and there is no agitation of the fuel bed. Moreover, the ash is continuously discharged from the furnace, permitting no accumulation of refuse in the furnace, and air spaces are kept continuously clean by the staggered arrangement of links.

FURNACES RECOMMENDED

Some typical modern settings, capable of producing high ratings and high efficiencies, are shown in Figs.

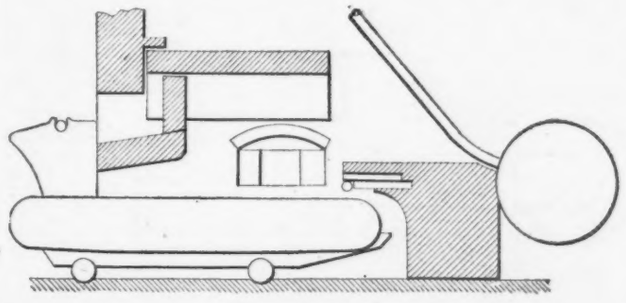


FIG. 4—FURNACE DESIGN TWELVE YEARS AGO

1, 2 and 3. Fig. 1 shows a modern chain-grate furnace with a Babcock & Wilcox or vertically baffled boiler. Notice that the length of arch is 75 per cent of the length of the grate and that the grate is 11 ft. long (3.3 m.). This may be increased to 13 ft. or 15

ft. (about 4 m.) if the arch is lengthened relatively. Notice also that the arch is steeply pitched and that the face of the bridge wall is built up vertically. This furnace provided with drafts of 0.5 in. (1.2 cm.) will burn 40 lb. of Nos. 3, 4, 5 or 6 Indiana coal per square foot of grate surface per hour.

Fig. 2 shows the application of the same principles

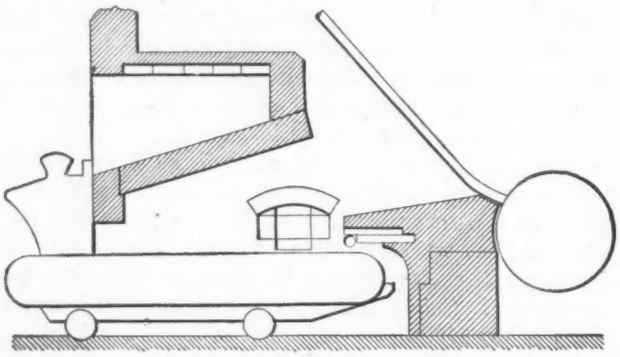


FIG. 5—REVISION OF FURNACE SHOWN IN FIG. 4

to a Stirling boiler. Fig. 3 shows the application of the same furnace to a Heine, or horizontally baffled, boiler. It will be noted that all of these furnaces have large volumes. The furnace volume per square foot of grate area in Fig. 1 (allowing for a grate width approximately equal to the furnace width) is 12 cu.ft. (0.33 cu.m.). The furnace volume as shown in Fig. 2 is 12 cu.ft. The furnace volume shown in Fig. 3 is 13 cu.ft. (0.36 cu.m.). The furnace volume commonly found in installations dating prior to 1916 was approximately from 3 cu.ft. to 6 cu.ft. (0.08 cu.m. to 0.16 cu.m.). The average length of arch was 4 ft. The average draft was 0.25 in. (0.6 cm.). Even under these conditions Indiana coals were handled without clinker trouble, but in a limited manner as regards efficiency and capacity. The results from modern furnaces, however, are far superior to those derived from the older type.

How to Improve Existing Furnaces

Fortunately, most existing furnaces permit revision which will greatly improve capacity and efficiency.

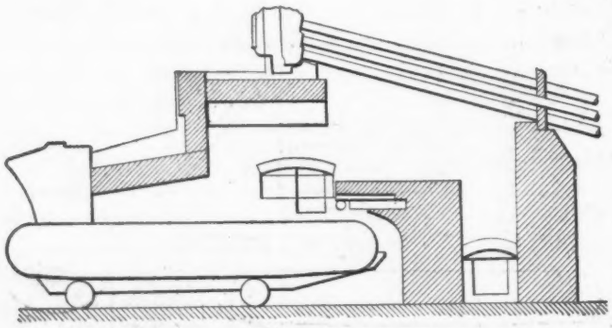


FIG. 6—OLD FURNACE EQUIPPED WITH SPRING ARCH

Modern arch construction can be installed. Arches can be set higher to give more furnace volume and thus improve efficiency. Longer arches can be installed, igniting greater quantities of coal and distilling the volatile matter off more rapidly. This gives better opportunity for the complete combustion of the fixed carbon. Bridge walls can be modified to reflect heat forward, helping the ignition and increasing the furnace temperature, which improves the combustion of the hydrocarbons.

A type of arch should be installed which will prevent air from immediately reaching the bottom surface and chilling it. This arch has a front row of tile set lower than the main arch surface. This greatly increases the furnace temperature at the front of the furnace. These and other modifications can be installed in most furnaces, and if at the same time an improvement can be made in the arrangement of boiler baffles to increase the draft, higher capacities and efficiencies can be obtained and the range of coals available can be greatly widened. Many plants have already revised their furnaces and have greatly improved their results. Some typical casts of revised furnaces are indicated in Figs. 4, 5, 6 and 7.

Figs. 4 and 5 represent the design of a furnace with a Stirling boiler installed twelve years ago and the recent revision of this furnace. With the original furnace only the better grades of Indiana coals could be used. In the improved setting the sprung arch is re-

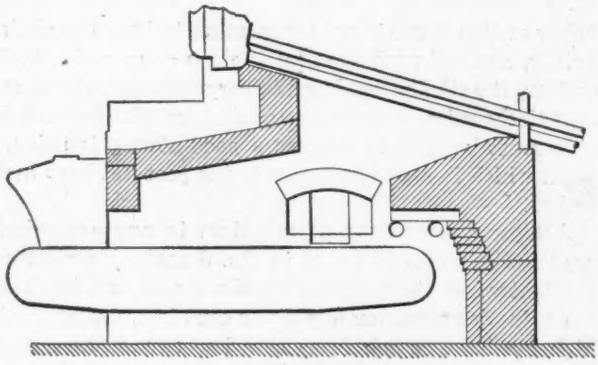


FIG. 7—REVISION OF FIG. 6 INCREASING CAPACITY AND RANGE OF COALS AVAILABLE

placed by one continuous arch, 7.5 ft. (2.1 m.) long. After this was done it was found that the lower grades of Indiana coals were entirely suitable, inasmuch as the draft and grate surfaces were adequate and the furnace formerly had been limited by the lesser ability to ignite these coals. Fig. 6 shows a furnace in connection with a vertically baffled boiler installed several years ago. Fig. 7 shows the revision of this furnace, an improvement which very materially increased the capacity and the range of coals available.

Conclusions

From this discussion the following principles are evident: (1) Indiana coals are being and will be extensively used. (2) The characteristics of some of these coals are: low fusing temperature of the ash, great tendency to clinker and large amount of clinker. (3) These coals give serious clinker trouble when the fuel bed is agitated. Continuous ash removal is preferable. With chain-grate stokers and modern furnaces high capacities and efficiencies can be obtained from all grades of Indiana coal. (4) Existing furnaces permit improvement. Each should be considered in the light of modern engineering knowledge and can be revised, widening the range of coals to include all Indiana seams and increasing the capacity and efficiency under all conditions.

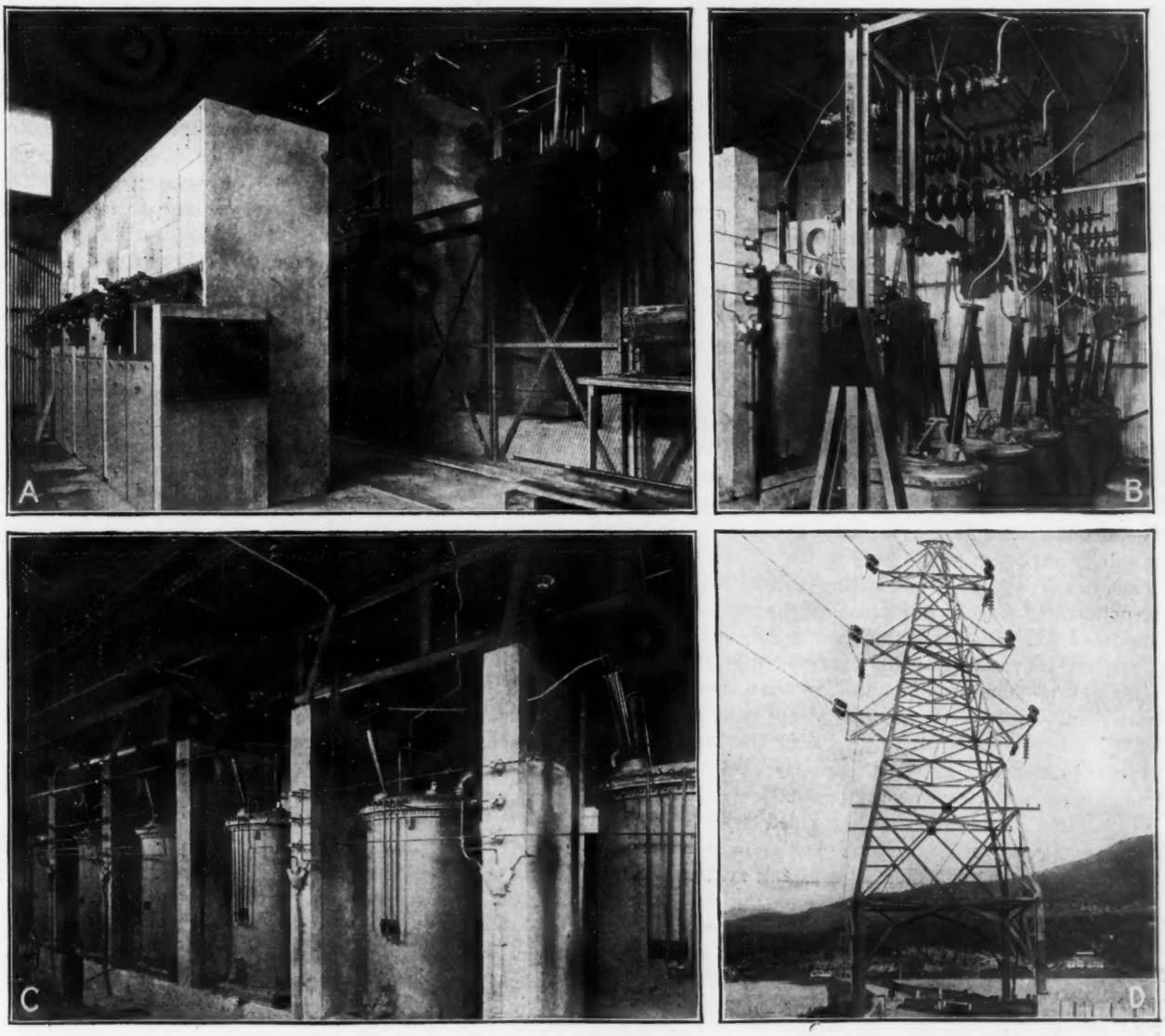
Recent Hydroelectric Development in Tasmania

70,000 Hp. Now Made Available and Other More Promising Development to Be Started—Electrical Construction Peculiar to That System—A New Field for Electric Apparatus Opened in the Antipodes

BY L. W. ALWYN-SCHMIDT
New York Economic Service Bureau

ONLY recently Tasmania completed an electric service system which has proved already of considerable value to the industrial life of the island. The power station on the Great Lake supplies power to the cities of Hobart and the Northwest Bay and has also made possible the growth of an electrochemical and electrometallurgical industry in Tasmania which could not be foreseen a few years ago. The war and the difficulties in obtaining the necessary machinery added largely to the construction expenses. Much of the copper, for instance, which was ordered for the transmission lines was commandeered and had to be placed at the then very high price. It is expected that the installation of big primary industries will soon be followed by supplementary industries. In this way Tasmania will become a new and important market for electrical material of all kinds, and its buying power will soon be felt in the United States. Part of the equipment needed for the extension of the facilities on the central stations in the Great Lake, in fact, was ordered in the United States, as an early supply could not be expected from European sources.

The Great Lake, the water of which is used as the motive power for the station, lies at an altitude of 3350



GROWTH OF HYDROELECTRIC ENTERPRISE IN THE ANTIPODES

A—Oil switch and bus compartments are readily accessible. B—High-tension oil switches and disconnecting switches supported on steel work, low-tension transformer wiring in the background. C—Transformers separated by concrete barriers and raised above floor of room. D—Special transmission tower at river crossing.

ft. (1020 m.) above sea level in the center of the island. After the erection of the dams it had an area of 50 square miles (13,000 hectares), and it is estimated that at a minimum 70,000 hp. can be obtained. The water is led from the lake by way of the existing river bed of the Shannon and an artificial canal to a second reservoir, whence pipe lines carry it to the power station, a total drop of 1120 ft. (340 m.). The distance from the reservoir to the power station is 9800 ft. (3000 m.) and is covered in part by a double line of wooden 4-ft. (1.2-m.) pipes 5500 ft. (1675 m.) long. The remaining 4300 ft. (1310 m.) will be covered ultimately by a system of four lines of pipes, of which three will be steel and one wood. The pipe system is joined just outside the station and led through adjustment pieces to the main turbine-gate valves.

The power station consists of a steel framework building set on a heavy concrete foundation and covered with corrugated-iron sheeting. The building is divided into two sections, of which one holds the turbines and the other the transformers. Originally only two turbo-alternators were installed. These, however, are now supplemented by a third set. The turbines, which are of the horizontal Pelton-wheel type, were made by an English firm, have a normal rating of 4980 hp. and run at a speed of 375 revolutions. They are equipped with automatic pressure regulators consisting of cast-steel deflectors which direct the water jet into the wheel pit without touching the buckets and limit the increase in the water pressure to 15 per cent above normal. By-pass valves are provided on all gate valves and the distributing pipes. The turbine governors are fitted with electric motors which permit the speeding up or slowing down of the machines. The alternators generate at a pressure of 6600 volts, excitation being furnished by two 120-kw. auxiliary turbo-generators that also supply the power requirements of the station.

All electrical apparatus up to the transformers is controlled by means of a switchboard on the turbine floor. The alternator oil switches are in the other section of the building. The connecting cables are laid in ducts constructed in the foundation. From the switches tappings are taken to the low-tension side of the step-up transformer. All the cubicle (bus and switch shell) construction and back connections of the switchboard are arranged for easy inspection and are designed in such a manner that no apparatus carrying high-tension current can be touched until the switches controlling it have previously been opened. Two banks of 6600/88,000-volt oil-insulated, water-cooled transformers are provided each with a normal capacity of 4050 kva. and a maximum half-hour capacity of 6000 kva. Each transformer has a thermometer provided with a contact maker connected with an electric bell and indicator. The transformers are connected by a piping system with an oil tank which will allow rapid emptying of the tanks in case of necessity. The lightning arresters are outside the power house. Features peculiar to this plant are shown in the accompanying illustrations.

The principal distributing field of the station to-day includes the city of Hobart and the Northwest Bay, a total distance of 77½ miles (131 km.). J. H. Butters, chief engineer and manager of the station, gave the following details of the transmission lines in a lecture before the Electrical Association of Australia, which has also been drawn on for the description of the plant.

The transmission towers are of the lattice-steel type, supporting two circuits of stranded conductors by means of chain insulators. The standard span is 600 ft. (182 m.). The towers are anchored by means of special stubs and stub plates buried 7 ft. (2.1 m.) in the ground at each leg. The proportion of rock met with in construction was extremely high, approximately 80 per cent of the excavation being of this character.

Five 10-in. (25-cm.) disks are used for suspension chains and six for strain chains. The conductors are suspended in such a manner that they may safely swing an angle of 45 deg. from the vertical. All joints are mechanical. A galvanized-steel "earth" cable is provided the whole length of the line and is attached by means of a clamp to the pinnacle of each tower. The conductors are attached to the insulators by means of special clamps having an arc shield consisting of a strip of copper bent around the conductor at each suspension insulator and held in place by the clamp.

The effect of the new power source on the industrial life of Tasmania became apparent immediately. Contracts for additional power were made by a great number of industrial enterprises which were drawn to the islands by the prospect of obtaining power. The first of these contracts was with the Amalgamated Zinc Company (De Bavays), Ltd., which took 4000 hp. with an option for another 26,000 hp. when required. This company has erected extensive works at Hobart. Another important contract was made with the Hydro-Electric Power & Metallurgical Company, Ltd., of Melbourne, which is constructing works at Northwest Bay. The contract is for 3500 hp. with an additional option for 6500 hp. The latter will be used for power for carbide production. To supply this increasing demand for power it has become necessary to increase the station equipment. Besides extending the transmission and distribution facilities, the receiving station at Hobart is being doubled in capacity by the installation of an outdoor substation consisting of three single-phase transformers of 1333 kva. each and one spare transformer for emergency.

A one-circuit transmission-line extension has been built from Hobart to Northwest Bay, a distance of 14 miles (22.5 km.). The construction of this line differs from the main line in that it is of the wood-pole type.

As shown before, much of the material used for the extension of the plant has been ordered from America, and there is every indication that more will be bought. The war made it impossible for the English manufacturers to supply equipment promptly to Tasmania, and the orders for the new equipment, therefore, had to be given to American manufacturers who were able to make early shipments. This has provided an opening for the American electrical industry.

Following the completion of the Great Lake development, several other schemes will be taken up, one of which is said to be even more promising than that at Great Lake. With these other developments added to the present facilities Tasmania will have at its disposal a set of hydroelectric stations which, when interconnected, will give the country a permanent and cheap supply of electrical power.

Promote the Welfare of the Community

All Forms of Autocracy Should Now Be Deposed in Our Own Country Also—Rule of Reason Necessary in Reconstruction, and Capital and Labor Alike Will Have to Abandon All Autocratic Methods—Reforms That Are Essential

BY CARL HERING

ONE of the most important lessons which this war has taught the world and which should be uppermost in the period of reconstruction is that the people will no longer submit to be controlled by autocratic powers. The world has decided against the unrestricted and selfish power of individuals over the people, when used autocratically. Right and justice must hereafter be taken into account in all dealings with the people. People living together in cities, states and countries are realizing that they form communities, and the only laws to which they will submit hereafter are those made by them for the benefit of the community and not for the benefit of individuals. We have spent lives and treasure in overcoming autocracy in parts of Europe, and the people of this country now will naturally no longer tolerate autocracy at home. The time has come for us to clean our own stables. The people will not longer permit fortunes to be made by our own autocrats, as in the past, by such principles as "the public be damned." The returning soldiers, and those in sympathy with them, will no longer tolerate at home what they have been fighting against abroad.

FROM ONE EXTREME TO THE OTHER

The grave danger which confronts us is the tendency to go from one extreme to the other. The crushing of autocratic rule is very apt to be followed by the rule of an ignorant, excited mob whose stimulants are chiefly such degenerate principles as plundering, revenge, robbery, murder and aversion to work, such rule as now prevails in Russia, Germany and Austria and as prevailed long ago in France, where three thousand or more of those whom the mob held responsible for the former misrule of the people by might were guillotined. France has had a number of these oscillations. The people rebelled again in 1870, establishing the "Commune," when the people found that they had been deceived by their government regarding the war at that time.

The physicists prevent such oscillations between extremes by dampening them; that is, by removing the cause of the swing in the opposite direction. This method can also be applied as effectively to communities by taking away the ammunition of the mob and of the people in general. This ammunition consists of their just causes of complaint. Without the latter the vast majority of the people will not uphold and encourage mob rule, and the few anarchistic leaders then become impotent and can be dealt with by process of law.

To prevent the uprising of mobs in the coming period of reorganization the important point therefore is to remove all just causes of complaint of the people at large, and to show that we are really a true democracy in which the government is by and for the people and not, as in an autocracy, by and for the few who are in power to rule by might. The German Kaiser's attempt to get autocratic control over his own and other nations was the cause of his downfall; the autocratic power of the Russian Czar was the cause of his assassination. All autocratic power—that is, all power of a few over the many for the benefit of the former and at the expense of the latter—should now cease in this country also, and should be replaced by individual liberty and freedom, though, of course, only as far as these are not injurious to the community. The welfare of the community should decide all issues.

This applies alike to the trusts, labor unions, political and religious factions, prohibitionists and all other parties who attempt to rule the community by might or autocratic power. The rights of the people to do as they please, provided they do not infringe on the rights, liberty and welfare of others and do not injure the community, must now be respected, or else the much desired peace on earth and the ending of all wars, civil as well as international, will not be accomplished, and the millions of lives lost and the vast expenditure of two hundred billions of dollars of the people's money will have been largely in vain.

The power of trusts and of large capital to control by autocratic methods must cease or the people will rise against it. One of the most vicious principles of "big business" is to destroy goods, such as foodstuffs, or autocratically to restrict production, in order to create an artificial shortage for the purpose of raising prices. Another is to destroy by autocratic power healthy and perfectly legitimate competition. When capital and the energy of "big business" are applied to making better goods at lower prices the people will welcome, uphold and gladly patronize such business. The small competitor then suffers, but as the community has gained, there can be no just cause for complaint. Many years ago the first pin-making machines destroyed the occupation of a large number of men who had been making pins by hand, but the community benefited by getting much cheaper pins, and hence there was no just cause for complaint. The sewing machine and many other inventions or improvements introduced by capitalistic enterprise killed competition by furnishing better results at lower prices, and the community therefore welcomed such business, even if because of it some individuals had to suffer the loss of their occupations. The dollar watch (of which it is said five millions or more are made and sold annually), the cheap alarm clock, the Ford automobiles, the five and ten-cent stores, the "movies," etc., are all good illustrations of "big business" in which the success was due to the reduction of prices. When people feel that they are getting the worth of their money they spend it freely.

Moreover, producing better goods at lower prices develops the much larger markets of the whole world. Germany's rapid commercial growth prior to the war was

due to this. Export trade enriches the community as it brings foreign money into the country. The vicious principle of selling more cheaply abroad than at home should be stopped by effective laws, as it means that the home community pays in part for the goods bought by the foreigners, thereby causing rebellious feelings in the home community.

Advocates of high prices also insist on a high protective tariff, which naturally also restricts exports of those protected products and taxes the community heavily for the benefit of a few individuals. A child needs a nurse to protect it as long as it is an infant, and it is generally better off for it; but if it needs such protection all its adult life it is an imbecile and an undesirable charge on the community. So with industries; the protection of an infant industry is very desirable and sometimes even essential, but if it needs such protection after it has had time to develop, it is an undesirable load on the community and, like the imbecile child, had better not have been born.

The world has grown smaller, in the sense that nations have become more closely allied and differences between them will tend to be leveled. Hence the cost of labor will also seek this natural level; where it is too high it will fall and where too low it will rise. The law of supply and demand is a law of nature and applies to labor as well as to goods. Attempts to violate this one of nature's laws autocratically must ultimately end in failure, as the engineer who attempts to violate other laws of nature knows too well. The wise engineer does not attempt it.

The right of a laborer to give up his job or to strike cannot be questioned since slavery has been abolished, provided, however, that he thereby does not become a charge on the innocent community. But to try autocratically to prevent another laborer from working when the latter is willing to work should from now on cease, as the world has now expressed itself against autocracy in any form and will no longer tolerate it. Demanding uniform wages for unequal skill is another form of autocracy which should cease.

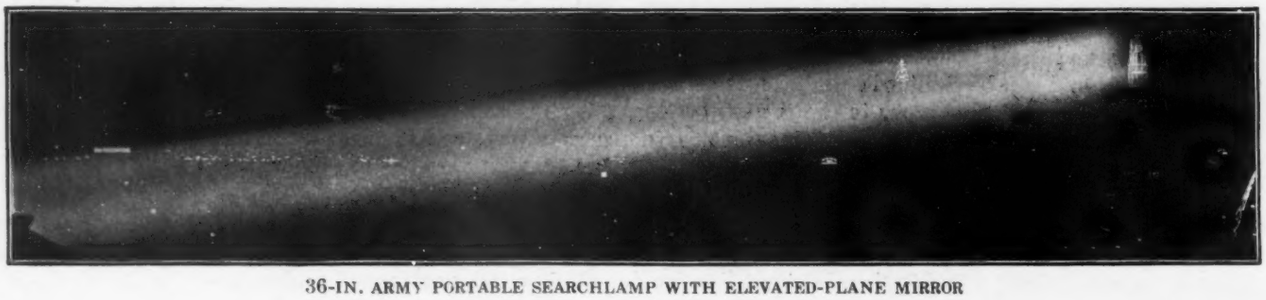
The price of labor must come down or else this country cannot enter the large and attractive markets of the world. The natural law of supply and demand, which it is foolish to shut one's eyes against, like an ostrich, will bring down the labor cost. But unless the cost of the essential commodities comes down in proportion a Bolsheviki uprising in this country, with all its horrors, will be sure to follow, when the millions of employees who have been intoxicated with prosperity and excessive wages will find no more employment. Disarmament in European countries will release an immense amount of labor which will flow into the industries and will lower costs.

The weakness in our business methods lies in part in the excessive overhead charges, often due to overcapitalization and to mortgaging property by bond issues; also in excessive selling costs. If raising the consumer's price a dollar makes it cost a dollar more to sell the goods, it is poor business, as the total sales will naturally be less. Well-made goods at low prices advertise and sell themselves. Quick sales enable one to turn over his capital more frequently during the year. Larger and quicker sales at lower percentage profits would in many cases yield larger annual profits and would open the large markets of the world to the goods; to forbid this is a form of autocracy.

The watered stock and overcapitalization of our railroads has been one of the most serious drawbacks to our progress and to our entering the markets of the world with our goods. Low railroad and shipping rates for freight, express and passengers, based, like the mails, on only the bare cost without profit, such as would result from proper government ownership and operation, and such as are the case in some foreign countries with whose goods ours must compete in the world market, would be one of the greatest possible stimulants to trade.

Another national weakness is that we are non-progressive in that we are too slow in the introduction of new inventions. Europe has in numerous cases been years ahead of us, making profits while we have been asleep. Capital, forgetting that to-morrow is coming, says, "We are making barrels of money now, so why make any changes?" Our method of standardizing goods is too apt to lead to stagnation when carried too far. There is no lack of inventive genius in this country, and we could become the most progressive of the large nations; but capital here does not encourage inventors. Large corporations have claimed that it is cheaper to steal a patent than to buy it; the profits then go largely to the lawyers, and the consumer ultimately has to pay.

The important problems in the present reconstruction period therefore are to depose all the many forms of autocracy in this country and to guard against the threatened Bolsheviki uprising following the very necessary reduction of wages, by reducing the living costs in proportion, and in general by not giving the people just grounds for rebelling. Overhead charges and selling costs should be reduced; overcapitalization and watering of stock should be prevented by laws which are really enforced; prices must be lowered in order to gain the large markets of the world; transportation costs should be lowered, as the mails are, to the bare costs, by government control; capital should turn more to improving our methods and goods, and to lowering their costs of production by developing new and improved processes and inventions; our patent laws should be reformed so as to encourage and protect the inventors more.



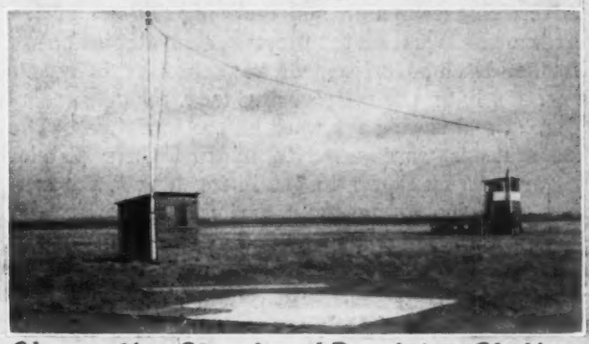
36-IN. ARMY PORTABLE SEARCHLAMP WITH ELEVATED-PLANE MIRROR

Left:
Pilot and Observer
Preparing for Flight

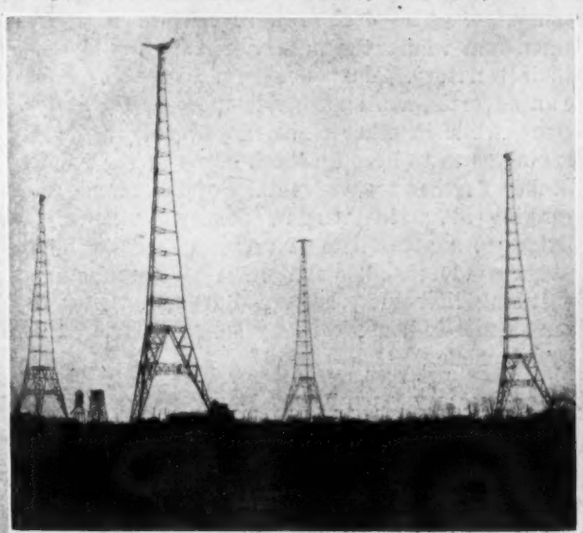
Right:
Testing Aerial
Before Flight

Radio Aero. Love Field, Dallas, Tex.

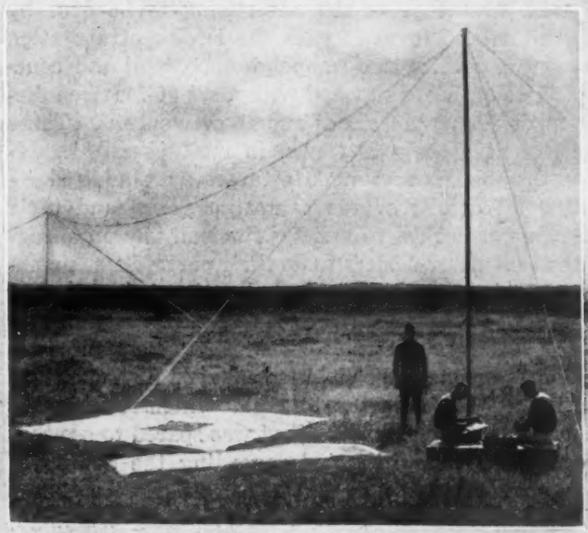
Field Radio Station, Dallas, Tex.



Observation Stand and Receiving Station



High Power Station, Annapolis, Md.



Field Radio Station, Dallas, Tex.

RADIO-TELEGRAPHY IN GOVERNMENT OPERATIONS

Co-operative Advertising in California

Object of the Movement Is Twofold, Comprising, First, the Education of the Public and, Second, the Amalgamation of the Separate Interests of the Industry in Merchandising

BY S. M. KENNEDY
Secretary and General Agent Southern California Edison Company, Los Angeles, Cal.

WITH the objects of educating the public to the possibilities of better electric service through using electrical appliances and of "tying in" the various branches of the electrical industry in the state that have been working effectively during the war along the lines of practical coöperation, there was published in the last three months of 1918 in many of the newspapers throughout California a series of ten display advertisements covering what is known as the California electrical coöperative advertising campaign. This advertising campaign was worked up and operated by a sub-committee appointed by the advisory committee connected with this campaign. Central stations, contractors, dealers and other merchandisers of electrical apparatus in the various business centers in all parts of the state participated.

EVERY CENTRAL STATION IN THE STATE COVERED

As soon as the copy was prepared a letter explaining the advertising campaign and inclosing the set of ten advertisements was sent to every central station in California. Each advertisement was scheduled to appear on a certain date, the set covering ten weeks commencing Oct. 21 and ending the week before Christmas. The central stations were asked to instruct their district agents or local managers to get in touch with the contractors and dealers in their various territories and advise them in which papers and on what dates the central-station companies would insert the advertisements.

A similar letter and inclosure were also sent to each contractor and dealer, encouraging them to coöperate and take advantage of the advertising to be done by the utilities and to work with the local central-station manager in making the campaign successful and beneficial. Dealers were supplied with a set of fourteen display cards for use in stores and show windows. These were advantageously displayed in most cases. In addition the jobbers and manufacturers were advised regarding all details of the campaign plans, and their salesmen were urged to assist, principally by encouraging the contractor-dealers to do their part. Some manufacturers also inserted timely advertisements in periodicals published in the state. The field representatives of the California electrical coöperative campaign made numerous personal calls on those engaged in the various branches of the industry to create intensive interest and arouse enthusiasm. No effort was spared to see that all concerned were informed regarding the details of the campaign and the objects to be attained.

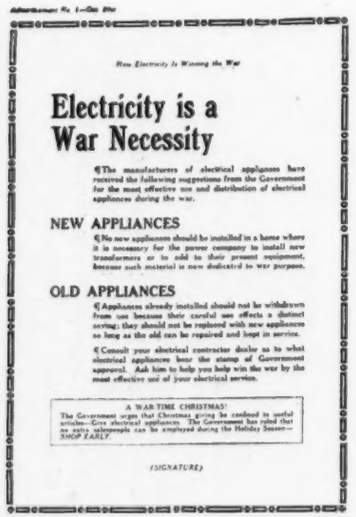
While it was in no sense a direct selling campaign, the copy prepared for the advertisements naturally emphasized the advantages of electric appliances, featuring them as a means of saving fuel and as practical Christmas gifts. It also recognized the fact that, under the stress of war, reconstruction conditions, transportation restrictions and embargoes on many kinds of materials used in electrical construction and extension, new business must be created by intensifying the use of existing installations. Throughout this publicity the consumer was urged as a patriotic duty to have all electrical appliances repaired and brought up to their utmost efficiency as a means of economizing fuel or its equivalent in electric power. The equally patriotic duty of using high-efficiency lamps was likewise woven into the educational fabric of the campaign.

The encouraging quickness with which the various branches of the industry "tied in" in this educational campaign made it possible to conduct the campaign on such broad and comprehensive lines that the work done cannot fail to result in a greater public interest in electrical goods than has heretofore been achieved by the sporadic advertising of the different interests. The pulling together of all branches of the industry in this campaign has had a marked influence on the newspaper publishers, many of whom have contributed freely very valuable reading notices regarding the campaign. The methods here used seem well directed to blaze the way for future campaigns having a similar object. With the restoration of peace, the resumption of normal conditions and the replenishment of appliance stocks, advertising conducted on these lines will have an opportunity of building an invaluable sales structure upon the educational foundation laid down by the present campaign.

Practically all central stations in the state and nearly all contractor-dealers have taken an active part in the campaign. The dealers were advised a week ahead when and where the advertisements would appear in their territory. Many dealers arranged to have their own advertisements alongside those of the central stations, while in other cases they were run the day following so as to keep up the interest of the public. The dealers further took advantage of the campaign by arranging attractive window displays, sending circular letters to selected lists of customers regarding the appliances advertised, distribution of manufacturers' advertising literature, lantern-slide advertising in theaters, house-to-house calls by solicitors and solicitation by telephone.

ONE COMPANY USED EVERY DAILY PAPER IN ITS FIELD

The central-station companies went into the campaign in a liberal manner, and most of them showed a sincere desire to do their full share in the effort made to bring about the desired coöperation in merchandising methods. One central-station company advertised in all the daily papers in its territory, each advertisement referring the reader to the contractor-dealers for demonstration and purchase of appliances advertised. Another


Advertisement No. 1—Oct. 21st

How Electricity Is Winning the War

Electricity is a War Necessity

¶The manufacturers of electrical appliances have received the following suggestions from the Government for the most effective use and distribution of electrical appliances during the war.

NEW APPLIANCES

¶No new appliances should be installed in a home where it is necessary for the power company to install new transformers or to add to their present equipment, because such material is now dedicated to war purposes.

OLD APPLIANCES

¶Appliances already installed should not be withdrawn from use because their careful use effects a distinct saving; they should not be replaced with new appliances so long as the old can be repaired and kept in service.

¶Consult your electrical contractor dealer as to what electrical appliances bear the stamp of Government approval. Ask him to help you help win the war by the most effective use of your electrical service.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

(SIGNATURE)

Advertisement No. 2—Oct. 28th

How Electricity Is Winning the War

Every User of Electricity Can Help to Win the War

¶Every branch of the Electrical Industry in the United States is co-operating with the Government to bring our electrical power to the support of the country in its time of need. The brains of the country are being directed to the saving of some essential—fuel, food, time, money, labor, transportation.

¶Every pound of coal every barrel of oil every ounce of metal is imperative for war needs. Whenever the utilization of electricity or the use of an electric appliance will effect such a saving a distinct war service has been rendered. Never in the history of man has there been an opportunity for the realization of more necessary service and general good than is presented to the user of electricity today. All dealers in electrical appliances and power companies have been advised what constitutes electrical war necessities. Have a talk with your electrical contractor dealer and learn how you can make the electricity at your switch more valuable to the Government.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

(SIGNATURE)

Advertisement No. 3—Nov. 4th

How Electricity Is Winning the War

Buy Useful Christmas Gifts This Year, and Buy Now!

¶The following restrictions under which retailers will sell holiday goods throughout the country have been agreed upon between the Chamber of Commerce of the United States and the Council of National Defense at Washington; co-operation of the buying public is requested.

¶Retail interests are not to increase their working forces by reason of the holiday business over the average forces employed during the year.

¶Normal working hours will not be lengthened during the Christmas season.

¶Retailers will use their utmost efforts to confine Christmas giving, except for young children, to useful articles.

¶Every effort will be made to spread the period for holiday purchasing over the months of October, November and December.

¶Deliveries will be restricted and customers will be asked to carry their own packages wherever possible.

¶Announcements of the new policy will be made by retailers in their newspaper advertisements.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

(SIGNATURE)

Advertisement No. 4—Dec. 11th

How Electricity Is Winning the War

Electrical Appliances For Christmas Gifts

¶The Government urges that Christmas giving this year be confined to useful gifts.

¶What is more useful than electrical appliances? They serve a two-fold purpose—saving for your government and saving for your household.

¶Electrical appliances are attractively manufactured and are a distinct addition to the interior ornamentation of any home. Ask your electrical contractor dealer for complete information regarding Government approved electrical appliances.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

(SIGNATURE)

Advertisement No. 5—Nov. 18th

How Electricity Is Winning the War

Your Electric Lamps Can Help Win the War

¶A little thing like an electric lamp is a big factor in the winning of the war.

¶Are you using the correct lamp? That's the point.

¶If you are using carbon lamps you are not doing your full duty to the Government. Carbon lamps are wasteful and consume more electricity than is necessary.

MAZDA Lamps Are War-Time Lamps

¶If your home, office or factory is not thoroughly equipped with MAZDA lamps see that it is done at once. Call in your electrical contractor or dealer and make the change immediately. MAZDA lamps effect a war time saving. Ask your electrical contractor dealer about other electrical war time savings.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

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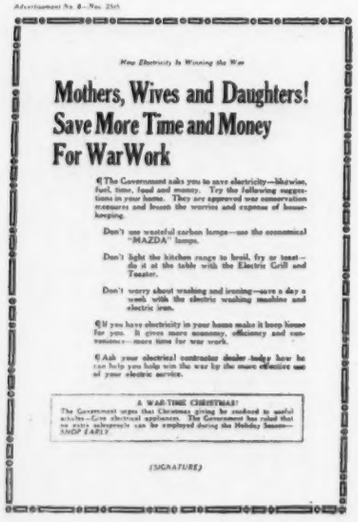
Advertisement No. 6—Nov. 25th

How Electricity Is Winning the War

Mothers, Wives and Daughters! Save More Time and Money For War Work

¶The Government asks you to save electricity—likewise, fuel, time, food and money. Try the following suggestions in your home. They are approved war conservation measures and lessen the worries and expense of housekeeping.

Don't use wasteful carbon lamps—use the economical "MAZDA" lamps.

Don't light the kitchen range to broil, fry or toast—do it at the table with the Electric Grill and Toaster.

Don't worry about washing and ironing—save a day a week with the electric washing machine and electric iron.

¶If you have electricity in your home make it keep house for you. It gives more economy, efficiency and convenience—more time for war work.

¶Ask your electrical contractor dealer today how he can help you help win the war by the more effective use of your electric service.

A WAR-TIME CHRISTMAS!
The Government urges that Christmas giving be confined to useful articles—Give electrical appliances. The Government has ruled that no extra salespeople can be employed during the Holiday Season—SHOP EARLY.

(SIGNATURE)

Advertisement No. 7—Dec. 2nd

How Electricity Is Winning the War

GIVE USEFUL CHRISTMAS GIFTS

¶What is more useful than electrical appliances? They make possible the saving of time, labor and money. This is a period in the history of the world when co-operation among nations is necessary for the welfare of millions. Our country is looked upon to aid in the reconstruction in Europe. A readjustment of our affairs is necessary to bring this about. Therefore, we all should heed the call for help and do our bit. Anything that does not promote a saving of food, time, labor or money makes the task harder. When Christmas shopping, go to the store of an ELECTRICAL CONTRACTOR-DEALER and buy useful electrical appliances.

THE WAR IS OVER
NOW FOR A HAPPY, PRACTICAL CHRISTMAS

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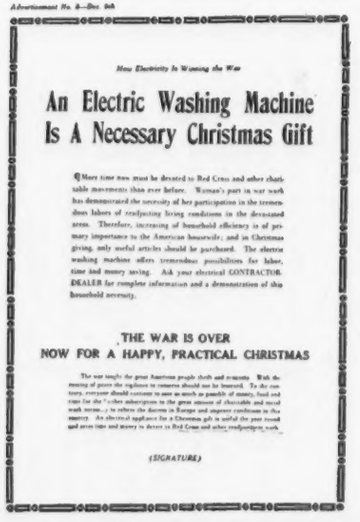

Advertisement No. 8—Dec. 9th

How Electricity Is Winning the War

An Electric Washing Machine Is A Necessary Christmas Gift

¶More time now must be devoted to Red Cross and other charitable movements than ever before. Woman's part in war work has demonstrated the necessity of her participation in the tremendous labors of readjusting living conditions in the devastated areas. Therefore, increasing of household efficiency is of primary importance to the American housewife; and in Christmas giving, only useful articles should be purchased. The electric washing machine offers tremendous possibilities for labor, time and money saving. Ask your electrical CONTRACTOR-DEALER for complete information and a demonstration of this household necessity.

THE WAR IS OVER
NOW FOR A HAPPY, PRACTICAL CHRISTMAS

(SIGNATURE)

Advertisement No. 9—Dec. 16th

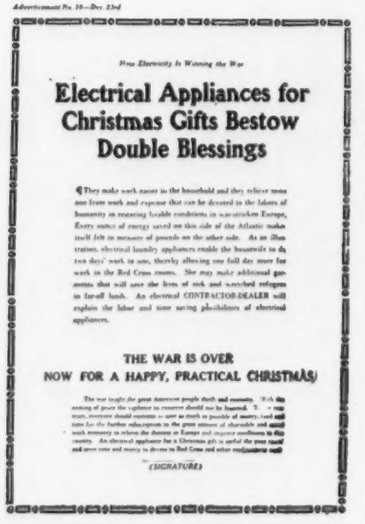
How Electricity Is Winning the War

Your Christmas Gifts Can Relieve the Misery of War Stricken People

¶Users of electricity have at their finger tips the agency for conserving essentials needed in the work of reconstruction. Although the war is over, the American people must continue to conserve. The world's food crisis will not have passed until the harvest of 1919 crops. In the meantime suffering Europe leans upon us. Therefore, when you use electrical appliances on your dining table, in the laundry and in your business, you make it possible for some one else to devote more time, more money or more labor to the worthy cause of war charities and other helpful organizations. Ask your electrical CONTRACTOR-DEALER to demonstrate the many essential electrical appliances.

THE WAR IS OVER
NOW FOR A HAPPY, PRACTICAL CHRISTMAS!

(SIGNATURE)


Advertisement No. 10—Dec. 23rd

How Electricity Is Winning the War

Electrical Appliances for Christmas Gifts Bestow Double Blessings

¶They make work easier in the household and they relieve some one from work and expense that can be devoted to the labors of humanity in restoring livable conditions in war-stricken Europe. Every ounce of energy saved on this side of the Atlantic makes itself felt in measure of pounds on the other side. As an illustration, electrical laundry appliances enable the housewife to do two days' work in one, thereby allowing one full day more for work in the Red Cross rooms. She may make additional garments that will save the lives of sick and wretched refugees in far-off lands. An electrical CONTRACTOR-DEALER will explain the labor and time saving possibilities of electrical appliances.

THE WAR IS OVER
NOW FOR A HAPPY, PRACTICAL CHRISTMAS!

(SIGNATURE)

SERIES OF TEN ADVERTISEMENTS USED IN CALIFORNIA ELECTRICAL CO-OPERATIVE ADVERTISING CAMPAIGN

Copies of these advertisements were sent to every central station in the state for insertion in the local newspapers circulating in their respective territory. The response was very general, and the campaign was a success in the production of new business and promotion of coöperation with the contractor-dealers. Prepared before the signing of the armistice, the original copy for all the advertisements had a patriotic "win-the-war" character, but a change to "The War Is Over" was subsequently made. The coöperative advertising plan will be of equal efficacy in the time of peace that is to ensue.

company, occupying a somewhat scattered territory, advertised in every town on its system in which there were one or more dealers. A smaller company agreed with the contractor-dealers to carry the advertisements week about—that is, one week the central station and the next week the dealers—during the campaign. One of the largest companies in the state turned over to the campaign all of its contracted newspaper space during the ten weeks' period and, in addition, in some localities purchased extra space. This embraced practically all the papers in ten counties, 135 in number. The amount of space contributed totaled 15,000 column inches, the value of which was in excess of $3,000.

When the committee prepared the copy the possibility of the war ending before the close of the campaign was not considered. As a consequence the slogan "Help win the war," conspicuously headlined on most of the advertisements and knitted into the text, was rendered useless with the signing of the armistice on Nov. 11. Three-fourths of the remainder of the series became obsolete, notwithstanding the fact that the fundamental argument for the use of electricity is fully as potent in times of peace as in war. Some of the companies, covering great areas of territory, had sent all of the copy to the publishers with date of publication, and forehanded printers had in many instances set it up as "time copy." Some very rapid revision became necessary, which, while in the main it probably did not detract from the value of the campaign, nevertheless took the appeal out of some cleverly constructed display lines.

Co-operation Between Central Stations and Contractor-Dealers Assured

Undoubtedly the advertising campaign will bring about closer coöperation between the contractor-dealer and the central station. It will demonstrate in an incontrovertible manner to the dealer that the central station is anxious to assist him in making a success of electrical merchandising and willing to spend time and money to carry on essentially instructive work. The advertising campaign should not only materially assist the contractor-dealer in his business but it should have an educational value in showing him effective constructive methods of increasing his retail sales. It will also increase the interest of many contractor-dealers in the retail side of their business.

It must not be overlooked that one of the principal objects of the whole plan of the California electrical coöperative campaign is to educate the contractor-dealer and make him a more aggressive, practical and progressive business man than he has generally been heretofore. The California campaign or any nation-wide campaign cannot be considered successful unless the contractor-dealer is brought to realize the importance of all the work that is being cheerfully done to help him and is willing and anxious to take full advantage of the assistance that is being offered and given him. Coöperation is not a one-sided affair, and the contractor-dealer must do his share in the coöperative plan and qualify himself as a graduated student in merchandising, so that he may be able to take up the commercial work which he asks the central station to lay down and carry it on with credit and profit to himself and continuing satisfaction to the central station.

ENGINEERING CHARGES ON OUTDOOR SUBSTATIONS

Allocation as Investment Attacked on the Ground that the Salaried Staff Is Maintained as an Operating Expense

The allocation of an engineering charge in the construction cost of an outdoor substation was attacked in a recent audit of central-station investment on the ground that the work was done by the company's technical salaried staff, maintained as an operating expense associated with the rendering of service. It was contended that the progress of the art of outdoor substation design had led to standardizations in practice requiring very little engineering in making such installations. The substation in question tied a 2300-volt network into a 22,000-volt transmission supply line; the installation cost about $1,200, and among the itemized charges were labor, $425, and engineering, $58.

In defending the principle of the engineering charge as a capitalizable item, the company pointed out that such a charge would necessarily have been included in the construction cost had the transformers and other equipment been purchased from one or more manufacturing companies installed and ready for service. The engineering charge in question was obtained from actual time slips turned into the office by company employees engaged in the design, layout and supervision of the installation. This work included a determination of proper soil and drainage conditions, proper pole heights, the best arrangement of wire racks, design of concrete foundations to carry the transformer, switching and lightning-arrester equipment, proper arrangement of fencing for the protection of the public and the apparatus, the most convenient assembly of apparatus and material, and the best local arrangement of lines. Another factor in the engineering cost was the relative inaccessibility of the substation from main lines of travel. Even if the engineering charges had not been itemized but had been prorated on a percentage basis, the company maintained their equity, pointing out that they were incurred in excess of normal operating tasks. Talented labor, it was held, is as much a part of construction cost as labor of the most unskilled grade.

AMERICA had almost reached the peak of production of war materials and supplies at the moment when the armistice was signed. The bills are now pouring in which require the government to pay the price of this great effort. The money paid to the government's creditors will find its way promptly back into the channels of commerce and trade and peaceful enterprise and back into the deposits of the banks. The welfare of the people depends no less in peace than in war upon the maintenance of the government's credits. The war is won; the war bills must be paid. The welfare and prosperity of this fair land of ours can only be preserved if the war expenditures of the government, now at their maximum, are promptly and ungrudgingly provided.—*Secretary of the Treasury Carter Glass.*

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

INCREASING EFFICIENCY OF BOILER-ROOM LABOR

Plant Managers Are Advised to Develop Practical Combustion Experts from Their Own Working Forces

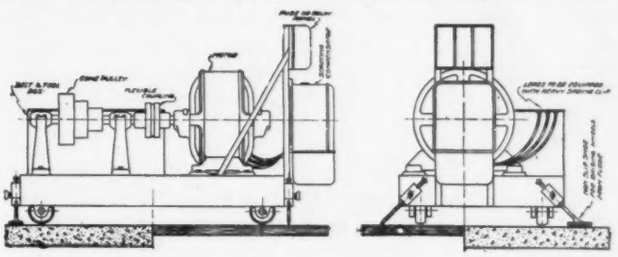
"Building up the standard of intelligence in the boiler room does not mean that one must go out and find combustion experts," said J. G. Worker of the Westinghouse Electric & Manufacturing Company before a recent meeting of the station operating committee of the Ohio Electric Light Association. "A good combustion operator need not be highly technical. Experience has shown that the practical man, with the proper training, is the best man for the job. Statements have frequently been made that certain ends can be attained in operation and economy by employing experts in certain plants. An analysis of such an organization will show that these experts were at one time in the boiler room firing coal. They were trained in combustion and gradually began to think for themselves along combustion lines until they became analytical and commenced looking around for the things that affect the economy of the plant. The building up of a boiler-room organization for any plant can best be accomplished by taking a good man in the organization and building him up for the job. Very little success will follow a plan of bringing outside men into the organization who have the reputation of being the ultimate authority on combustion work."

PRACTICAL SUGGESTION FOR EMERGENCY MOTOR SERVICE

Motor-Control and Power-Transmission Equipment Mounted on Truck so Service Can Be Restored Without Delay or Waste of Material

To enable the maintenance department to reëstablish service quickly in case of motor trouble, A. P. Lewis, Boston, engineer for the General Devices & Fittings Company, offers the following suggestion. The idea is intended to cover an emergency service in an industrial plant where most motors are mounted overhead and the power is transmitted by belt.

The scheme, as illustrated, embodies the following: A four-wheel truck, approximately 3 ft. (90 cm.) in width by 6 ft. or 8 ft. (1.8 m. to 2.4 m.) in length and of extremely heavy and substantial construction, is mounted on four swivel wheels of large diameter. On this truck is mounted a proper-sized, low-speed induction motor of suitable characteristics to fill the plant requirements. The motor is connected through a flexible coupling to a cone pulley, which has suitable steps to fill within certain limits the speed requirements of the line shafts where emergency service may be required. A compensator is provided with the usual protective devices and flexible leads therefrom, ending in high-capacity spring clips, which may be fastened to exposed live parts of the motor circuit in trouble. At the four corners of the truck, on the ends, are inclined holding plates in which pins are fastened with heavy wing nuts for holding them. For wood floors the pins end in points; for concrete floors swivel shoes of non-slip, stair-tread material are preferred. On the truck is a box containing a suitable length or lengths of belt



EMERGENCY MOTOR SET MOUNTED ON TRUCK

with patented splicing connectors for quickly joining ends. The box also contains a small jack.

With such an equipment it is feasible to restore complete service within a few minutes of notification of trouble to the maintenance department, and to do so with a minimum amount of labor and with no waste of temporary material.

RESULT OF EXPERIENCE WITH SUBMERGED COAL STORAGE

Coal Stored for One Year Loses Only 317 B.t.u. Out of 12,518 B. t. u. per Ton—Results Are Fully Satisfactory

In 1912 the Indianapolis (Ind.) Light & Heat Company constructed at its Mill Street station a concrete pit 300 ft. long, 100 ft. wide and 20 ft. deep (91 m. by 30 m. by 6 m.), designed to contain 13,000 tons of coal submerged. Recently the company constructed at its Kentucky Avenue station a reinforced-concrete coal pit which is 145 ft. long, 65 ft. wide and 32 ft. deep (44 m. by 19 m. by 9 m.), built on the same general lines as the former pit and holding 8000 tons. The company burns 500 tons of coal per day, and as the two pits have a total capacity of 20,000 tons submerged and 10,000 tons of coal above the water line, this means a sixty-day supply on hand if both pits are filled. The total cost of the two pits was $60,000, or $2 per ton of storage.

The results of under-water storage, according to T. N. Wynne, superintendent of power, have fully met the company's expectations in that it prevented fires and preserved the heating value of the coal. No trouble has been experienced with excessive moisture when burning pit coal if mine run is used. Screenings which have

been stored under water burn with difficulty. Whenever coal from the pit is to be used on the stokers it is loaded into railroad cars and the water is allowed to drain off for about six hours before the coal is put into the bunker. The coal may also be drained by lowering the water in the pit sufficiently to uncover the coal required. It has been found in storing the coal that capillary attraction will take care of coal piled above the water level of the pit as much as 8 ft. or 10 ft. (2 m. or 3 m.).

COMPARATIVE TABLE—STORED VERSUS FRESHLY MINED COAL

Kind	No. of Samples	Moisture	Volatile Combustible Matter	Fixed Carbon	Sulphur	Ash	B.t.u. (Dry)
Freshly mined	502	14.68	35.98	56.39	2.14	7.63	12,518
Stored.....	741	14.05	34.98	55.99	2.34	9.03	12,201

The accompanying table shows comparative tests of freshly mined coal and coal which has been stored under water for approximately one year. The coal referred to in these tests comes from the same mine and the same vein. It will be noted that the coal has lost during storage only 317 B.t.u. out of 12,518 B.t.u. per ton.

PORTABLE SUBSTATION OF UNUSUAL CAPACITY

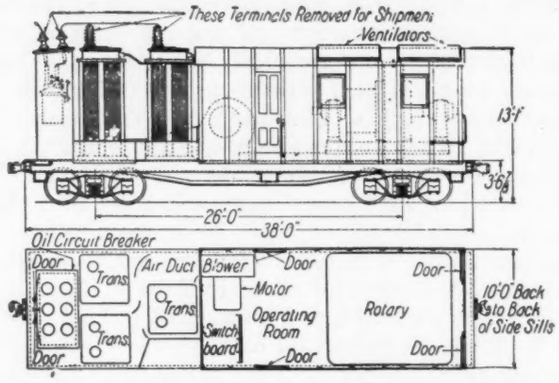
1500-Kva. Converter Installed on Car of Moderate Size—May Be Used in Any Substation or Along Railroad Line

One of the largest portable substations that have yet been produced is owned by the Long Island Railroad Company. It is shown in plan herewith and contains a 1500-kw., 650-volt, 25-cycle, direct-current Westinghouse rotary converter, three 500-kva. combination oil-insulated self-cooled and air-blast single-phase outdoor transformers, complete switching equipment and auxiliary apparatus. The transmission is at 11,000 volts, but the substation is arranged for 33,000 volts, which may be used in the future. The car is so constructed that it can be used for service both indoors and outdoors.

The permanent substations of the Long Island Railroad Company are constructed with a railroad siding entering each building. At the time when one of these stations is about to be subjected to a long-period overload which is beyond the capacity of its converting apparatus the portable substation is conveyed into the building, connections made to the high-tension line and the converter paralleled with the permanent units. The portable outfit is also available to take the place of any permanent unit which may be temporarily unusable. It can also be conveyed to any desired point along the railroad where the high-tension power is available and used as a separate substation during rush hours or holidays.

The over-all dimensions of the car, built by the Railway & Industrial Engineering Company, were restricted, and this caused many manufacturing difficulties. Its length was limited to 38 ft. (11.5 m.) owing to the fact that the permanent substations are equipped inside with railroad sidings on which the portable substation is established when operating in multiple with the permanent units. Owing to traffic regulations, the width was restricted to 10 ft. (3 m.). A height restriction was also recognized by the builders. In addition to these restrictions the apparatus of the substation had to be so distributed as to allow plenty of space within the car for proper attention to the converter and to switching. The arrangement permits four or five men to be with the operator without interfering with his work as far as space is concerned. The apparatus is so disposed as to concentrate all available space near the center of the car and so provide ample room for him.

The most difficult problem was that of the transformers, when it was necessary to bring the height and floor space within the required limits. Forced-air cooling is provided in addition to the self-cooling properties of these units. A small motor-driven fan, housed inside the main cab, which also contains the converter and switchboard, supplies the air, which is discharged into a duct surrounding the lower part of the transformer, where baffle plates and guides so direct it that an even distribution is obtained on all sides. Through a duct whose minimum height is 18 in. (45.7 cm.) the air is carried to the transformers. The normal radiation of the case is thereby increased over 25 per cent, permitting a material reduction in the size of tanks.



LARGE SUBSTATION READILY MOVED TO POINT OF OVERLOAD

With the addition of a leveling device the converter installed is entirely standard in construction. The function of the leveling device is to keep the machine level in case the car is standing with its floor at an angle. Four trap doors in the roof provide the ventilation. Each of the four doors is provided with a water-tight removable cover which is kept in place during outdoor operation. When the covers are removed, as they are for outdoor service, a total opening of 75 sq.ft. (6.7 sq.m.) is provided. Holes through the floor inside the converter bedplate provide ventilation in addition to the air which enters the doors and windows. The roof of the cab over the machine is composed of a removable section built upon a framework. This construction is necessary in order to place the converter in the car or remove it.

With the exception of using a Burke horn-gap high-tension switch, the switching equipment virtually follows the standard practice for portable substations. The car is provided with an oil circuit breaker, which is installed in a separate housing at the opposite end of the car from the main cab. The direct-current terminals are placed on opposite sides of the car in order to make more convenient connections with the direct-current bus of the permanent station.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

NECESSITY OF CULTIVATING THE LOCAL BANKING HOUSE

Talk Made Before Doherty Managers Points Out the Business Principle Involved in Asking for Neighborhood Money

Perhaps one of the most difficult tasks for the average central-station manager is that of interesting the banker and investor in the securities of the central-station property. As a rule there is a satisfactory national demand for large issues, but when it comes to the local demand it is another question. Yet it has been proved many times that local investment is of added value to a utility.

At one of the meetings of the executives of the Doherty Organization held a short time ago in New York, J. M. McMillin, assistant manager of the bond department of Henry L. Doherty & Company, took up this subject in a paper entitled "The Relation of the Property Manager to the Banker and Investor." The author spoke of the necessity of cultivating the local investors and of the way in which the local bankers should be approached. He said:

"In your efforts to perfect the understanding of our business and of our investment securities on the part of the citizens of your community your first endeavor should be directed toward winning the heart of every banker in your town. His good opinion has a local value which of course you understand. But you may not be aware that his impressions go very far afield, extending in a more or less definite way to every investment channel. You can also appreciate the importance of developing your local credit to simplify and minimize the problems of the main office in financing your needs.

"The measure of your banker's good opinion is a willingness to make your property loan, and it may therefore be worth while to call attention to some things which may be expected to come up in your talk with him when you are applying for financial accommodations.

"On the occasion of your first visit the banker may strike his hand and keep the matter from a decision while he puts you through a certain inquiry. He has certain answers and questions always for use in such emergencies. Show him, however, that he wants to do business and he will find the money.

"Incidentally it is worth while to mention that the banks must lend their money in order to make earnings themselves. Therefore they have loaned us money all the time, and to make a satisfactory impression it may be that you can use some part of this money a very good deal of the time. The banker wants good loan accounts as well as deposit accounts, and if you conform to principles of sound banking he will finally come to the conclusion that he does not ever wish to see you fully paid up for very long.

"You should take the position that your company is primarily essential to the welfare of the territory which supports his bank and as such is entitled to his consideration. You are not asking for a loan as a personal favor but simply as a matter of business and as a representative of an industry which is entitled to be heard. Its own future lies absolutely in that of the community and its industry."

CURTAILMENT OF METER TESTING IS A NECESSITY

Such Suspension of Activity, However, Should Be Considered with Special Reference to Types of Meters in Service

BY HALBERT R. THOMAS

Meter and Test Department, Southern California Edison Company, Los Angeles, Cal.

Some divisions of the central sation have been particularly hard hit by present conditions, and not the least among them is the meter department. This has been a favorite place for young men to serve their technical apprenticeship in the organization, and for that reason the draft has laid heavy hands upon it. Many companies which have hitherto maintained regular schedules for periodic meter tests have for some time been confronted with the necessity of curtailing or even suspending this work for an indefinite period.

Any such suspension should be considered with special reference to the types of meters in service. Whatever decision may be reached with respect to the induction type, the most strenuous efforts should be made to keep up regular tests on commutator-type meters. Experience has shown that such meters fall off rapidly in accuracy if calibrated at intervals of more than a year at most. Semi-annual tests are preferable on the larger meters, although they will probably keep their accuracy for longer periods if provided with diamond jewels.

Inspection as a substitute for testing may be found practicable on the induction type of instrument, the inspector merely cleaning the meter and replacing the jewel if necessary. In a commutator-type meter, however, a new jewel frequently shifts the position of the commutator slightly, altering the path of the brushes and throwing the meter badly out of calibration. Such a change is in this case a dubious procedure unless accompanied by a test.

In general, it must be realized that the effect of neglecting this work is an increasing aggregate of small errors, which has a very decided influence on the revenues, even though this may not easily be traceable to the proper source.

ELECTRIC TRUCK REDUCES THE COAL-HANDLING COST

Carpet Manufacturer Finds that Bigger Loads Can Be Hauled in Less Time and at 50 per Cent of the Cost of Manual Labor

By using a storage-battery truck fitted with a V-dump body of 1-yd. capacity to haul coal to boiler house and storeyard, coal-handling cost has been reduced about 50 per cent by C. H. Masland & Son., a carpet manufacturing concern of Philadelphia. Coal is unloaded by gravity from railroad cars into bins fitted with radial gates.

The truck is loaded in eight seconds with a ton of coal simply by opening a bin gate and allowing the coal to drop into the truck. When the loading was done by hand it took five minutes to do this work.

In the morning the truck hauls coal 300 ft. to the boiler house. In two hours sufficient coal is hauled to

HANDLING COAL BY ELECTRICITY

keep the boilers going all day. The truck then carries coal from the bins to the storage pile. With this method about 20 tons can be handled per hour.

The haul from bins to storage pile is about 115 ft. each way. The loaded truck makes the trip from bins to storage pile in forty-five seconds. The return trip (empty) is made in thirty-five seconds. The load is discharged in ten seconds.

To enable the truck to get on top of the storage pile a runway was built. The truck drives with all four wheels and has no difficulty in negotiating the comparatively steep grade.

By using this method railroad cars are released quickly and demurrage charges avoided. The storage-battery truck, moving heavier loads in less time than is possible with man power, keeps the receiving bins empty so that coal can be unloaded just as soon as it is received.

Analysis of data on several recent installations shows the daily operating cost of a Lakewood storage-battery truck, according to the manufacturer, the Lakewood Engineering Company, Cleveland, Ohio, to be $3.35, including mechanical maintenance charges, interest and depreciation on machine, lubricants, storage-battery maintenance and charging cost (based on 2 cents per kilowatt-hour), but not operator's wages.

QUARTERLY BILLING PLAN TRIED IN PHILADELPHIA

One-Third of the Bills to Go Out Each Month—Adoption of This Method Is Expected to Make Better Labor Conditions

Beginning with Jan. 1, the Philadelphia Electric Company will render all bills to residential customers quarterly. The terms of the contract will not be changed. The minimum charged residences, now 75 cents per month, will be $2.25 covering the three months' period. The added charge for failure to pay a bill within ten days will be calculated as at present. The only point in which the bills under the new system will differ from the monthly bills that customers have been accustomed to receiving will be in proportioning the present monthly charges and methods of computation to the three months' schedule.

The bills will not all be delivered in one month. Approximately one-third of the number of residence customers will be billed in the month of January, a third in February and a third in March. This will establish a quarterly basis which will thereafter be maintained.

The company does not expect to make any change in its guarantee deposit requirements. At present the average deposit for residential customers is $5, and it is believed that this will be ample under the quarterly plan.

The company does not expect the change to effect any appreciable reduction in its meter readings and billing expense at the outset. Departmental routine has necessarily had somewhat deferred attention during the war period owing to lack of help as well as to inefficient help. It is believed that the introduction of the quarterly billing plan will release the time of some of this help so that it may be employed upon other work which is somewhat in arrears.

EFFICIENCY AND RESPONSIBILITY OF PUBLIC UTILITY EMPLOYEES

New Year's Greeting of Dallas (Tex.) President Points Out the Importance of Harmony and Unstinted Service

Efficiency and responsibility formed the theme of the New Year's greeting of J. F. Strickland, president of the Texas Power & Light Company, Dallas Power & Light Company, Texas Electric Railway and Dallas Railway Company, to his "fellow workers." Part of the greeting is here quoted:

"During recent years we have heard and read a lot about 'efficiency.' All of us desire to be more efficient. It has always seemed to me that efficiency is just another name for coöperation. If you can't coöperate with your fellow workers, if you can't realize that their work is important as well as your own, then you are not efficient. When it comes to responsibility, we must not only be ready to assume it, but must also be willing to do the real work that responsibility brings with it. It is certainly true that responsibility comes to him who is capable of assuming it, and it will surely come to you if you are really ready for it. Increased responsibility means increased opportunities for service, and the one who would win great responsibilities must be ready and eager to seize such opportunities."

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Dimensions of Transformers.—A. R. LOW.—The object of this article is to classify the principal problems of transformer design and to compare certain assumptions, methods and results. Problems such as finding the minimum cost of losses when the power transformed is given are solved by the method of determinants.—London *Electrician*, Nov. 15, 1918.

Coil-End Leakage in Direct-Current Machines.—The methods of Arnold and Hobart for calculating the leakage reactance of the coil ends in direct-current machines are based on approximations and on the average results of experiments. The author makes a more accurate calculation and arrives at formulas by which the value of the leakage reactance of any machine may be easily computed.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, April 7, 1918.)

Eddy-Current Losses in Massive Armature Conductors at No Load.—L. DREYFUS.—The distribution of the slot field around the armature shows a wealth of higher harmonics even at no load, and in consequence heavy eddy-current losses are produced in the embedded conductors. The calculations of the magnitude of these losses now given show that the eddy currents react upon the flux density in the teeth, and that this reaction has the effect of setting an upper limit to the eddy-current losses. In fact, already, with moderate depth of the embedded conductors, the eddy currents force back the slot-leakage field into the teeth, so that the slot is freed more and more from the stray field, and the total copper losses decrease instead of continually increasing with the slot depth, as is commonly assumed. In conclusion, the author points out that the conditions at load are much more complex and have hitherto not been cleared up by theory or experiment. Tests made at short circuits are not adequate to elucidate this point, as only the armature leakage flux remains in the slots under this condition. On this account the investigations of Field may only be considered as giving a lower limit for the losses at full load. It is furthermore incorrect to add the no-load eddy-current losses to the short-circuit eddy-current losses in calculating the full-load losses, and there is room for the development of a theory embodying the theories set up for no load and short circuit.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Archiv f. Elektrot.*, 1918.)

Dynamical Theory of Electric Engines.—L. B. ATKINSON.—The paper was given before the Institution of Electrical Engineers as the tenth Kelvin lecture. The lecture developed some of the early work of Lord Kelvin on what may be called the lines adopted by Carnot in the theoretical investigation of heat engines. Assuming in every case an "ideal" engine without losses due to friction, leakage and resistance, he proceeded to develop the theory, showing the action and the theoretical attainable efficiency. "Engines," in the sense used in the title of the lecture, includes generators and motors. Such engines are classified by Mr. Atkinson under the heads of electrostatic, magnetic and electrodynamic, each head being subdivided into classes defining the essential differences of action.—*Electrical Times*, Nov. 14, 1918.

"Hydro's" Queenston Generator Specifications.—Specifications have been issued by the Hydro-Electric Power Commission of Ontario for the big generators needed for the initial installation at Queenston, which will probably total 200,000 hp. It is recognized, however, by the engineers of the commission that these specifications are tentative, and alternatives to be submitted by the tenderers will receive consideration. Each generator is to have a capacity of 45,000 kva. at a power factor 80 per cent lagging. The main problems in the design of these alternators are recognized as ventilation, temperature rise in the insulation, thrust bearing for the vertical shaft and the braking device required to stop the rotor when the turbine gates have been closed. It is said that the ultimate capacity of the station may reach 1,000,000 hp.—*Canadian Engineer*, Nov. 21, 1918.

Lamps and Lighting

Diffusion of Light and Its Definition.—N. A. HALBERTSMA.—The terms "diffusion" and "diffused" are loosely employed in practice. Sometimes diffused lighting merely implies absence of glare and severe shadow contrasts. When applied to globes it is, on the other hand, intended to convey the degree of uniformity of brightness over their surface, irrespective of the illumination. In other cases the terms are applied to convey degree of uniformity of illumination. The author now attempts to find a precise method of defining the diffusion of light by a surface, either by reflection or transmission. Light may be distributed (1) by refraction (prisms, cylindrical lenses, etc.), (2) by mirror reflection from polished surfaces, (3) by diffused transmission through media (opal glass, frosted glass, etc.) and by diffused reflection from more or less matte surfaces. The two former are designated "regular," the two latter "diffused" distribution of light.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, May, 1918.)

Use of Solid Angles and Flux of Light in Lighting Problems.—J. TEICHMUELLER.—Dealing with problems in illumination, we have a choice of two formulas, based respectively on the determination of illumination by the inverse square law at specified points and its determination in terms of the flux of light divided by the area illuminated. The author seeks to show that the latter method is more useful in practice than is generally recognized. To illustrate its application he imagines a

lamp to be surrounded with a suitable globe, divided into zones, by the aid of which the flux of light in each zone is readily visualized. He then proceeds to show how the derived illumination can be calculated. The method is applied to several practical cases, and it is shown how the average and also the maximum and minimum illumination obtained from two lamps in a given position can be estimated. It is remarked that the method is more readily applicable in open spaces than in rooms, where reflection from walls and ceilings adds materially to the illumination on the working plane.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, June, 1918.)

Generation, Transmission and Distribution

Advantages Resulting from a Throttle-Piece at the Inlet of Reservoirs Destined to Diminish Water Hammer.—DE SPARRE.—The paper is entirely mathematical and proves that for a given pipe and a given value of water hammer a definite reduction in the volume of the reservoir can be brought about by a given throttle. The reduction of the kinetic energy in the water due to the compression is shown to be a definite fraction of the initial kinetic energy, so that the water oscillations are almost completely suppressed and the dangers of resonance eliminated.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Comptes Rendus*, July, 1918.)

Interconnection of Power Systems.—The article consists of a symposium dealing exclusively with Pacific Coast conditions. The subject was introduced by P. M. Downing in an article entitled "Technical Features of the Interconnections of Electric Power Systems of California." He reviewed the rapid growth of the loads on the various California systems, pointed out the increasing cost of fuel oil and estimated the future loads these systems will have to carry. Gaskell S. Jacobs continued the discussion in a paper, "Electric Power in Northern and Central California," in which he also reviewed the rapid growth of the load in these sections, the scarcity of fuel oil in recent times and the rising cost of electrical energy generated by the use of fuel oil. Other causes leading up to the power shortage were indicated as the curtailment of the expansion of generating and transmission facilities, the loss of a considerable portion of skilled labor attracted to more remunerative forms of activity, and finally the lack of rainfall and snowfall in the mountains and consequent depletion of stored water resources. The writer then reviewed the growth of the system in northern and central California and pointed out the prospective power developments in the section. Other papers presented were "The Function of the Pacific Gas & Electric Company in the Interconnected Operation of the Power Companies of Central and Northern California," by J. P. Jollyman; "California-Oregon Power Company and Northern California Power Company," by William M. Shepard, and "Fuel Conservation by Interconnections with the System of the Sierra & San Francisco Power Company," by J. E. Woodbridge.—*Proceedings* A. I. E. E., December, 1918.

Design of Turbine Runner Bands.—JOHN S. CARPENTER.—The article has special reference to high-speed runners. A detailed analysis of hydraulic conditions at the band is developed, giving a simple formula to determine the angle of the band with the vertical.—*Canadian Engineer*, Nov. 21, 1918.

Traction

The Hydroelectric Railway.—E. BELLONI.—A navigable canal joining Milan to the River Po, and consequently to the Adriatic Sea, is now being considered by Italian authorities. In the present article the author draws attention to the fact that this canal would be so expensive both as regards construction and operation that the water transport carried on by it would not provide sufficient support for ordinary railways to operate with it. The author therefore proposes the reduction of the scheme of a large navigable canal to a much smaller power canal energizing a certain number of hydroelectric stations feeding an electric railway running along the canal. Figures and data are given from which the economic convenience of the solution set forth by the author can be estimated.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Elettrotecnica*, September, 1918.)

Electrification of the Montreal Tunnel Zone.—WILLIAM G. GORDON.—The author describes the electrification of the tunnel through Mount Royal at Montreal which was built to give the Canadian Northern Railway entrance into the heart of the city. The tunnel emerges from the mountain several feet above the level of the city, and it is proposed to extend an elevated line at the same uniform grade to connect with the proposed viaduct on the lines of the harbor commission. The tunnel is 3.1 miles (5 km.) long, and the method of construction is described in detail. The power is purchased and delivered to a substation near the west portal of the tunnel. The equipment of the substation is described. At present there are six electric locomotives in operation having a one-hour rating of 1280 hp., and it is proposed to add multiple-unit motor cars for handling the local traffic. Details of the equipment and dimensions of both the locomotives and motor cars are given. The catenary system, which is described in detail, has a number of unusual features due to special local conditions and the extremely low temperatures which sometimes prevail in Montreal.—*Proceedings* A. I. E. E., December, 1918.

A Two-Unit Automatic Substation.—WALTER C. SLADE.—This article describes recent developments in the automatic control of railway substation equipment on the system of the Rhode Island Company and is devoted mainly to an account of the first two-unit rotary-converter automatic station wherein two machines are arranged to run singly or in parallel as required by the load conditions. Another automatic substation is installed at Harmony on the Chepachet line and is supplied with 60-cycle energy at 11,000 volts, purchased from the Narragansett Electric Lighting Company. The Oakland and Harmony substations had to be built to meet the demands of increased and adequate transportation service. The construction of the former allowed about 186,000 lb. of copper in the form of feeder wire to be removed. Automatic control was adopted mainly because of the assured saving in operating labor, and it is estimated that the annual saving in labor and inspection expense will amount to about $600 per year. The equipment of the Oakland substation is described and details of the cost analysis are given.—*Electric Railway Journal*, Dec. 14, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

MANUFACTURERS PUSHING THEIR PLANS FOR RECONSTRUCTION

Conference of Group Chairmen Held and Arrangements Initiated for Larger Meeting Later—End of General War Service Committee

At the call of the General War Service Committee of the Electrical Manufacturing Industry a meeting of chairmen of the groups composing the different branches of the industry was held at the Engineering Societies Building, New York, on Tuesday of this week. More than forty were present. In the unavoidable absence of A. W. Berresford, chairman of the committee, Clarence L. Collens, 2d, presided as chairman.

Mr. Collens reviewed the joint meeting of the General War Service Committee and the Electrical Manufacturers' Council, held on the previous day, at which the committtee made its final report, and outlined the matters for consideration. These were, in brief, the best form of organization, the best method of maintaining contact with the government, a closer definition of what the electrical industry is, and the plans for the larger mass meeting which is to be held a little later. The larger meeting, at which it is desired to have the entire electrical manufacturing interest represented, is to be addressed by several speakers of national prominence.

Talks were made by a number of those present, and after discussion the following resolution, passed at the meeting on the previous day, was read:

Whereas the General War Service Committee has completed the task for which it was appointed and made its final report to the Electrical Manufacturers' Council, now, therefore, be it

Resolved, that the Electrical Manufacturers' Council recommend to the Electrical Manufacturers' Club, the Associated Manufacturers of Electrical Supplies and the Electric Power Club that the resignation of the General War Service Committee as tendered be accepted; and further

Resolved, that the Electrical Manufacturers' Council and the General War Service Committee in joint meeting recommend to the chairmen of the various war service group committees that they continue the present group organization, such groups as at present form divisions of existing organizations reporting and acting through and with those organizations, such groups as are not at present members of any organization to join with an existing organization or to perfect one of their own as they may elect. Coördination of all to be effected by representation on the Electrical Manufacturers' Council, through which body the proper contact with governmental departments is to be effected; and they further recommend that no contact between individual divisions or groups and governmental departments or other associations be effected without reference first to the Electrical Manufacturers' Council.

The meeting approved this resolution as presenting its views of the action which should be taken. Steps will be taken promptly by the Electrical Manufacturers' Council to put in the hands of every electrical manufacturer a full report of the meeting and, in addition, to complete plans for the larger gathering to be held at a date in the near future.

STRIKING EMPLOYEES BACK AT GENERAL ELECTRIC WORKS

Most of Men Return to Work at Various Plants—Hearing by War Labor Board, Whose Jurisdiction Company Does Not Admit

A hearing was held in New York on Wednesday of this week by the War Labor Board in the General Electric Company sympathetic strike case. At its conclusion the board announced that it would take under consideration and state later whether or not it would assume jurisdiction in a case where one of the parties was unwilling to be bound by the decision. Most of the men are back at work.

On Jan. 2 Secretary Lauck of the board notified company and labor representatives that the Secretary of Labor had referred the matter to it as an "emergency" adding that under these circumstances the board would assume jurisdiction provided the men on strike returned to work immediately.

President E. W. Rice, Jr. of the company replied that the only controversy was at Erie, where 20 per cent of the employees went out because of alleged unfair discharge of ten men. Speaking of the Schenectady, Pittsfield and Fort Wayne works, he said:

As to these three plants, there being no controversy between the management and the employees, and awards or agreements having been made therein, we respectfully suggest, after consultation with the works managers, that there is no occasion for a hearing, as the company has performed and will continue to perform, notwithstanding the violation by the employees, the terms of all existing awards of the National War Labor Board. As to the controversy at Erie, Mr. Griswold, the manager of the Erie plant, who, under our method of organization, is the person in the company with full power to deal with labor problems at that plant, has advised you of his decision not to submit to the jurisdiction of the board. In that decision I concur. As a matter of courtesy to the board, however, a representative of the company will appear, if you still decide the hearing to be necessary, to give the board any additional information.

So far as work was available, the men at the various plants have gone back. At Schenectady, where about 15,600 went out, all but about 1000 have been taken back, and there was no work for these at the time. The situation is similar at Pittsfield and Fort Wayne. At Erie the men who were needed were taken. None were out at Lynn at any time. The men were taken in a preferential order, the general result being that first preference is given to those who had been in the government military or naval service, then those having dependents, etc.

Efficiency and Economy of the New Mexico

Secretary Daniels and Commander Foote Testify Before Committee on Naval Affairs of the House of Representatives—"Country Has Cause to Be Proud of This Achievement in Engineering"

SECRETARY OF THE NAVY DANIELS and Commander P. W. Foote testified on Jan. 2 before the committee on naval affairs of the House of Representatives to the success of electric propulsion on the New Mexico. Secretary Daniels read a prepared statement. In introducing it he said that the committee of course was very much interested in the result of "what we all regarded as a great experiment in putting electric drive on the New Mexico." Mr. Daniels recalled that after that was ordered there was great opposition to it. A hearing was held before the House committee and also before the Senate committee, when a number of engineers and men who were interested in turbines and ship construction and propulsion appeared and said it would be fatal. There was a division of opinion among experts as to the wisdom of putting electric drive in so big a ship as the New Mexico. "But we studied it," added Mr. Daniels, "and I got the opinion of the best experts in the department and some outside, and decided upon that policy; and I have prepared a statement here showing that our policy has been justified." The Secretary then read his statement, as follows:

SECRETARY OF THE NAVY'S STATEMENT

"I recently paid a visit to the battleship New Mexico, which is the latest dreadnought to join the fleet and the first and the only one of any nation to have electrically operated propelling machinery. On this account she has been an object of surpassing interest to the officers of our own navy and to those of foreign navies as well, and to electrical engineers in general. You will remember that when we decided to equip the capital ships of the 1916 program with electric drive it was represented to this committee and to the Navy Department that we were making a great mistake and that we should think twice before embarking on such an unprecedented experiment. I did not regard it as an experiment, for we were in the fortunate position of being the only nation that had had any experience with this system of propulsion, and that experience was of such a satisfactory character that it would have been unpardonable if we had not profited by it to the fullest extent possible.

"The general board was unanimous in advocating its adoption because of the superior military advantages that its use would secure, and Admiral Griffin, chief of the Bureau of Steam Engineering, not only saw no objection to it from a technical standpoint but was strong in his advocacy of it. Added to this, the best advice that I could get outside of the Navy Department was so convincing of the efficiency of electric drive that I had no hesitation in giving my approval to its adoption.

"Under the circumstances it was but natural that I should have awaited the trial of the New Mexico with interest to learn how well her machinery had functioned—I never doubted that it would prove a success. The result was satisfactory from every point of view and confirmed the judgment of all who were in any way concerned in its design and adoption. There was not the slightest mishap with any part of it—everything worked to perfection, and the crew was as enthusiastic over the performance of the machinery as is the department proud in the possession of such an efficient dreadnought.

"The machinery was designed to develop 26,500 hp. at full speed, which it was expected would give the ship a speed of 21 knots. She actually developed more than 31,000 hp. and maintained for four hours a speed of 21¼ knots—and this when running at a displacement 1000 tons greater than her design called for. If she had been tried at her designed displacement, as is customary with all new ships, she would have made 21.5 knots without any trouble whatever, and what is still better, she could have kept up this speed as long as her fuel lasted, for, like all our later dreadnoughts, she is an oil-burner and there would be no reduction in speed due to the necessity of cleaning fires, which must be done in coal-burning ships after a run of four hours at top speed.

"When we entered into contract for the machinery of the New Mexico, we stipulated that, in addition to being capable of developing the maximum power, she should also give an economy at cruising speed very much superior to that obtainable with the turbine installations that we had previously used, and I am happy to say that this stringent requirement also was met. As a matter of fact, the New Mexico will steam at 10 knots on about 25 per cent less fuel than the best turbine-driven ship that preceded her.

"The shipbuilders who have contracts for electric drive ships were as interested in the trials of the New Mexico as we were, and I arranged that they should have representatives present to witness the operation of the machinery. All took advantage of the opportunity and were as much impressed with the ease and efficiency of operation as were the naval representatives.

"On the whole, I think the country has cause to be proud of this achievement in engineering, not alone because of the pronounced success in this particular instance, but because of the assurance it gives us of the superiority of our capital ships to those of foreign nations."

MR. DANIELS ANSWERS QUESTIONS

In replying to questions Secretary Daniels said that the New Mexico went into commission in October. The trial was last month.

Mr. Butler—Have you had any report from her since she went into commission?

Secretary Daniels—Yes. I was on the ship myself about a month ago.

Mr. Butler—How far has she run since?

Secretary Daniels—She had a trial; then she was at New York at the review and went up from Newport News to New York, and now she is going back to Newport News.

Commander Foote—She had two sets of trials.

Secretary Daniels—Yes; she had two sets of trials.

Mr. Butler—But then she has been in commission only since October and has been on this coast?

Secretary Daniels—Yes, on this coast; she has not been abroad.

The Secretary asked Commander P. W. Foote to tell about the economy in fuel consumption and the technical operation.

COMMANDER FOOTE EXPLAINS TECHNICAL POINTS

Commander Foote—In the main, sir, the big advantage of the New Mexico over any other ship of her size is this: Of course, when you come to the big-powered ships of that class, the reciprocating engines practically reach their limit, in view of the size and diameter, and so forth, and there was a paper read by Admiral McGowan to the Society of Naval Architects and Marine Engineers a few years ago, showing the wisdom of putting reciprocating engines in the Texas and New York, after they were built as turbine ships, and there was great criticism for doing that. At the time she was built a direct-connected turbine did not get the efficiency; but when you went above those horsepowers, then you had to go to the turbine, and in that stage of the game the turbine was direct-connected. Now it is a fundamental principle of the turbine that its efficiency depends upon a high rotary speed, and the converse is true in regard to the ship's propeller; the ship's propeller to have a high efficiency wants a big diameter and low speed. Therefore, if you have a turbine running at its maximum efficiency, you have to have a high speed, and to have the propeller running at its maximum efficiency you have to have a low speed; and if you hook the two directly together, you get a very poor operating efficiency. At that time the mechanical reduction gear and the electric connection was devised. We had these turbine-driven ships, and England has had them; and then we had the Utah and that class of ships, where the turbine and propeller were hooked together. The North Dakota was an example. And you had to pull the speed of the turbine down as slow as you could and speed the propeller up as high as you could and hook them together; and you had a poor compromise because neither turbine nor propeller was running at its proper efficiency. That was the problem, to get this efficiency. With the mechanical reduction gear, with the ship always running at one speed, you could get a very high efficiency. If you have one of the big liners running back and forth at 21 knots, the mechanical reduction gear is a fine thing, and it is probably superior to an electric drive; because you can design the turbine to run at its very best efficiency and put in a reduction gear to step that speed down to get the best efficiency in the propeller, and have a very happy result.

Mr. Hicks—Isn't it a great waste?

Commander Foote—No; the efficiency of the reduction gear is 98 or 99 per cent; it is a beautiful thing. But when you come to a man-of-war ship, the battleship, which in ordinary times of peace won't operate at a greater speed than 15 knots, you want to be able to make top speed at any time or be able to maintain top speed for a long time, and you have a difficult matter where you are running except at a constant speed. And it is in that type of ship and the big battleships, where we want to operate at different speeds, where electric propulsion finds a very happy application, and that is accomplished in this way: The fundamental principle of the relation between the electric generator and the electric motor is this—I am speaking of alternating currents: The speed of the generator, which is the prime mover, of course, is as to the speed of the motor inversely as the number of poles. You know in the machines you have there are many electric poles. For instance, in the motor you have two poles and in the generator you have thirty-two poles, and your speed of the motor is as one to sixteen, so you step down your electric windings. Now, then, you can rig your motor so that you can throw a switch and have thirty-two poles in that motor, or you can have sixteen, or you can have sixty-four poles. Now that is where we utilize the principle in electric propelling machinery, because if we want to drive the propellers at low speed, which is the top speed of the ship, we throw the switch and have a certain number of poles in this motor. Of course, the poles of the generator remain fixed, you cannot change them; but you throw a switch which gives you the high efficiency of 21 knots, or if you want to step down from 21 to 15 knots, you throw a switch and you can maintain the same relation of the propeller to the mover and you get practically the same economies.

Mr. Hicks—If you keep on burning the same amount of fuel, there would be no economy?

Commander Foote—You turn a valve and cut off the oil. . . . You reduce the steam; the man out in the fire room is told to cut down to so much steam pressure and the engine man just draws it off.

After other questions the discussion was continued.

Commander Foote—To get the power from the motor you have four motor sets. . . . You have a motor over here, a motor over there, one here and another one there (indicating). In here you have your turbo-generating units; there is the turbine and here is the generator (indicating), and out here, of course, is the fire room. The engine room is very small and each one of those motor compartments is isolated in water-tight compartments. That is another thing I think Mr. Daniels is going to speak to you about later. He spoke about the many military characteristics, which are of great value, which you obtain in this type of machinery, due to the flexibility. We have four shafts, and on each shaft is this motor. These motors, of course, are simply connected by a wire, which you can lead around the corners and put in a heavy tube. Each one of these compartments is separated into water-tight compartments. Another beautiful thing is you can absolutely destroy half of your motive power, one of the two big generating units, and the other unit will drive that ship still at 17 knots; because you throw a switch and put either one or all of those four motors on both of them, or the four motors on one of them. And a torpedo could explode in this engine room and blow out this generator and the ship would still go on; or you could blow out this motor compartment or two of them and she could still go on. . . . Another beautiful thing about this machinery, which is superior

to any other type, is the fact that you have just as much power to run your ship astern as you have to run your ship ahead.

Mr. Butler—How much more does this kind of machinery cost than the other?

Commander Foote—It costs less.

Mr. Butler—Did the machinery in the New Mexico cost less than the steam?

Commander Foote—Mr. Daniels thrashed that point out very thoroughly when he got the bids up.

Mr. Oliver—The claim was made by the turbine men that it would be very much more expensive?

Commander Foote—When we came to get the estimates from the New York yard, Mr. Daniels told them to make the bids on electric propelling machinery and direct-connected machinery, and very much to a great many people's surprise, the bid of the New York Navy Yard on that construction was less than on the other.

Mr. Butler—You do not consider this as an experiment then, any longer?

Commander Foote—No, sir.

Mr. Butler—I do wish, however, the Secretary would put this ship through 5000 miles and see what she would do, and that would silence all of this talk.

Commander Foote—I proposed that. The reason so many people had misgivings about electric propelling machinery was because they thought it was a great experiment. As a matter of fact it was not a great experiment, even on the big ships of her class; because what we are really doing is taking an electric power plant that has been running on shore for years, in principle, and putting it in a ship. There was very little new to be found out except in its application to the propeller; that is all.

The Chairman—You had worked it on the Jupiter, about a 15,000-ton ship, very successfully before that?

Commander Foote—Yes. But it was a new thing so far as putting it on a fighting ship was concerned; but really the only new thing so far as the principles of design of electric machinery goes, the only new thing in the New Mexico, was in our design of a motor. That was new in so far as a certain principle was applied to a motor of that size. It is quite a technical point; but in the New Mexico they had a type of motor which is called a double squirrel-cage motor, and that type of motor had not been built in big sizes before. But it was thoroughly tested out in experimental sizes and there was no question about the success of the design long before it was put in a ship. I happened to be at the General Electric Company's all the time this was tried out, so I know the details. In the Jupiter you had a motor of a different type. You take an alternating-current motor, you have to have a certain design to start that motor under load. You have to have a certain amount of resistance in your circuit; that is what it is, so that when you start the load you have something to push in. So that in the Jupiter the General Electric Company designed a very particular rheostat, a water rheostat unique in its design, and it worked wonderfully well. But it was big and heavy and filled up space in the engine room, so that when we came to lay out a design for a battleship motor they wanted to cut out weight, save space and so forth, so that they adopted this double squirrel-cage motor, which is called the Boucherot type. And it has two sets of windings, one of which has a high resistance and a low reactance and the other a high reactance and a low resistance. So that when you throw on your current the motor is self-contained with the low-resistance connection at the starting speed. For instance, in starting the machine under load, when that electric load comes up to high speed it is at its full power then, and the resistance of the two windings or, rather, the currents that project themselves between the resistances of the two windings and the motor operate this at higher efficiency, and the whole thing is self-contained. The big question with that type of motor is that it particularly lends itself to adaptation.

Mr. Oliver—You remember, at the time the decision of engineers was announced to install this electric propulsion, that the committee was deluged with opinions by expert engineers from all of the country that it was not only an untried experiment but it would prove very costly to install it—far more so than a continuance of the old style?

Commander Foote—I remember that quite well.

The Chairman—I might add this qualification to those opinions, that they came from one source.

Mr. Oliver—That is true. A great many of those opinions came from the steam-engineering people, and I think it is quite an achievement that you have been able to overcome those apprehensions which their opinions led us to believe might be expected.

Commander Foote—There is one thing always involved in this type of machinery, and that is that the particular type of machinery is only built by a small number of builders. And the whole thing, as I say, came to a show-down when the Secretary of the Navy required the navy yard at New York to submit estimates on the two types of machinery. For a year or two previous it had been the plea of many shipbuilders that the electric machinery would be so expensive that they could not tackle it. The Navy Department, I know, had always said to the different builders or, rather, to the advocates of electric propulsion: "When the shipbuilders propose and plan that electric propulsion, then we will push it along," and many of the shipbuilders came along and said they could not do that because it would be too expensive.

Mr. Butler—Do we contemplate putting this same style of propulsion on our new ships?

Commander Foote—Yes, sir; on the battle cruisers.

Mr. Butler—You are going to put it on the battle cruisers; how about the battleships?

Commander Foote—Oh, yes. I speak of the battle cruisers because they have to have so much horsepower.

Mr. Butler—I understand; but how about the battleships?

Commander Foote—Yes, that is the calculation.

Mr. Hicks—What current do you use, alternating currect or direct current?

Commander Foote—Alternating current, 2200 volts. Electric propulsion was about the only way to get the necessary horsepower in a battle cruiser. The battle cruisers have 180,000 hp.

Mr. Butler—I know we talk about all these shafts, and four shafts with 45,000 hp. in each shaft, and 180,000 hp. for the cruisers, and all that; but that is all

guesswork. I desire to know whether the engineers of the navy are satisfied that we should put it in all of them.

Commander Foote—We only find the greatest enthusiasm.

Mr. Hicks—Horsepower for horsepower, how much economy is there found to be using this method of propulsion over the turbine?

Commander Foote—It is very striking; I can give you a picture. . . . Most people of the navy familiar with running ships will remember a ship like the Louisiana and Connecticut class—I used to be chief engineer on the Louisiana, and I know we used to think we were doing pretty well when we ran that ship 12 knots on 125 tons of coal a day. That is a very much smaller ship than the New Mexico. On the New Mexico I asked one of the engineers the other day what the consumption was in tons of coal per day at 12 knots, and he said about 85 tons. . . . I was speaking about the power to go astern. In turbine ships if you put in a duplicate set of reduction gears to run astern the same as to run ahead, of course that is a very different thing; but that would be difficult and you would not want to do that. What they do is to have about 40 per cent power for stern operation. With the electric gear all you have to do is to throw a switch and you have the same power to run astern as you have to run ahead. I remember in the discussion of the different types of propulsion many people to my mind used the rather high-sounding expression, "We do not build our ships to go astern; always to go ahead," which sounds perfectly good. But sometimes we can only get home by going astern. We have a very beautiful illustration in a case where the bow was cut off and the ship used her power to go astern. And there are many reasons why we want to run astern in maneuvering a ship in battle.

Mr. Hicks—How about the weight of the turbine-driven apparatus for corresponding horsepowers?

Commander Foote—The weight is a little bit in favor of the reduction—you are speaking as compared with reduction operation?

Mr. Hicks—Yes.

Commander Foote—Of course no one any longer compares power with direct connection.

Mr. Hicks—I mean at reduction.

Commander Foote—At a certain speed, counting your installation, the weight is a little in favor of the reduction; but you have to take into consideration so many other things.

Secretary Daniels—How much space do you save?

Commander Foote—Oh, the space saved is very striking. I wish I had a picture here which shows you the layout; because in an engine room, either direct-connection turbine or a reduction-gear turbine, you have to have a number of steam turbines. If you had a shaft like that, four shafts, you would have one or two turbines on each shaft, and you would have to have a head and a stern, you know. That means a mass of steam piping running in each one of those turbines, steam piping running from the turbine of the big condensers, and the engine room is one mass of steam pipes, which means a large amount of space. Now with the electric gear you simply have two turbo-generators, one steam pipe there and one leading to the condenser, another one coming here and another one coming here to the condenser (illustrating), and if you compared the pictures of a plant, you would have a very wide comparison. I had the drawing of an engine-room plant layout and a complete layout of reduction gears, and that whole engine room looks like a forest of steam pipes; and if you lay alongside of it your electric drive, you have a big open space engine room with the engine-setting here (illustrating). And the space comparison is very striking. Mr. Daniels, I remember, spoke of it when he inspected the New Mexico awhile ago. That turbo-generator is about 21 ft. long, I think—that may be a little short—but that whole ship can be driven by this comparatively small unit, set in that small compartment.

Mr. Peters—What is the minimum-size ship on which you use this power?

Commander Foote—Of course to-day the Jupiter is the smallest we use for experimental work. Outside of that, I believe the battleship is the lowest one. They have made a study of the layout for putting it in destroyers, but I think on the whole the reduction gear has been adopted more generally.

Mr. Peters—You do not think it will come down to destroyers eventually?

Commander Foote—I doubt it. It finds its highest adaptation in this big ship of big force, when you want to operate at different speeds, where you have to save space and so forth.

The Chairman—To save the great storage space for fuel and machinery?

Commander Foote—Yes, sir.

Commander Foote—Another thing is the General Electric motor, which is another good military point. In building fighting ships, of course everything has to be secondary to the military features, and the question of whether a certain type of machinery will be a little more economical is secondary to the military characteristics, where it is a fighting machine. And instantly the point comes up in connection with this machinery, that no matter how heavily your ship is pitching, you won't get any racing in the propeller. That, of course, is also a characteristic thing of the electric propulsion, due to this same fundamental principle of the relation of the poles of the generator to the poles of the motor. Those motors are what we call synchronous motors, which means the motors always run at certain speeds in direct ratio to the prime mover, whether or not that propeller is running in air or water.

Mr. Britten—Isn't there a material strain on the shaft, though, when the propeller comes out of the water?

Commander Foote—No, the load would come off. Now, you see what happens in a reciprocating engine, direct-connected steam-engine propeller operation, for instance; if your ship pitches her tail out and the engine speeds up, that is what breaks your shaft.

Mr. Britten—That is different under electric drive?

Commander Foote—With the electric drive it does not speed up; that is the point. You do not have this danger of speeding up; it runs at the same speed, and of course, the load coming off, there is no breaking strain. . . . The power comes down automatically. That is done by your governor on your turbine.

CONGRESSIONAL INERTIA ON WATER-POWER LEGISLATION

No Real Reason Why, Even Now, the Conference Committee Should Not Be Able to Adjust Differences Between Senate and House Bills

There remains less than two months of the present session of Congress in which to hope for the passage of the water-power bill now in conference between the two houses. The Washington representative of the ELECTRICAL WORLD reports, nevertheless, that, after a careful examination of the two bills now in conference by those who have made a study of the subject, there is no real reason why, even at this late date, the conference committee should not be able to adjust the differences between the Senate and the House bills and report out a bill which could be agreed to by both houses and become a law before Congress ends on March 4.

At the time this dispatch was filed in Washington Senator Shields of Tennessee, who has been ill at his home, was still absent, and inasmuch as he is the chairman of the Senate conferees, and an agreement was made among the conferees that nothing would be done until his return to Washington, no action had been taken by the conferees and none was in sight. Up to the time this was written the conferees had held but one meeting, and they had not actually begun their work. But, it is being pointed out in Washington, unless the water-power bill is passed before March 4, it will die in the present Congress, and much new work and many studies will be required in the new Congress by new committeemen. If that happens, it is stated, the result will obviously be due solely to the inertia of Congress, or, rather, in this instance, to the inertia of the conferees placed in charge of this important legislation.

There are leaders in Congress, even among the conferees, who are endeavoring to avoid the situation which will be created if the conferees allow all the work of the present Congress in this vital matter to come to naught.

THE THREE MAIN POINTS OF DIFFERENCE

This is especially true, the Washington representative of the ELECTRICAL WORLD reports, when it is realized that the so-called three apparently insurmountable obstacles, referred to hereafter, which prevented the conferees on the Shields-Adamson bill from coming to an agreement in the previous Congress, have now disappeared. These are:

First, the House (Sixty-fourth Congress) insisted that each separate application for a permit for water-power development should be approved by Congress, and this the Senate would not agree to. In the bill which recently passed the House and which is now in conference the House receded from this position.

Second, the House (Sixty-fourth Congress) insisted upon a charge or tax for privileges granted, for revenue purposes, and the Senate would not agree upon the ground that the federal government has no constitutional right to make any charge beyond a fair return for the use of government lands and to cover expense of investigation and supervision. While the bill passed by the House and now in conference provides that the licensee shall pay to the United States reasonable annual charges in an amount to be fixed by the commission, yet the Secretaries of War, the Interior and Agriculture each state in their testimony before the House water-power committee that it was not the purpose of those who framed the bill to make it a revenue-producing measure, and they advocated limiting the charges to an amount sufficient to cover cost of administration. During the time the present bill was under consideration by the House amendments to fix charges of from 50 cents to $2 per horsepower per year, and also to revise charges every ten years, were defeated. The Senate bill provides that the United States shall be reimbursed for costs of investigation and supervision and that the United States shall be paid for the use of government lands. Thus, it is pointed out, the House bill is admittedly not intended as a revenue measure, and as the Senate bill provides for payment to the United States of administration expenses and for the use of government lands, all ground for controversy could be eliminated by limiting charges to an amount sufficient to cover cost of administration plus any excess received for use of government lands.

Third, the Shields-Adamson bill of the Sixty-fourth Congress provided that the United States might purchase power developments after fifty years by paying their "actual cost" less "any intangible elements," which experts estimated might not return the grantee over 60 per cent of his actual investment. The Senate bill, on the other hand, provided that the United States should pay "just compensation" if it took over the property. The present Senate bill provides for payment of "just compensation." The House bill provides for payment of the "net investment" of the licensee, which would insure repayment of the money actually invested but no more. The House bill also provides that the government may take over the property at any time upon payment of "just compensation," and therefore if at the end of the license the property is not worth the amount represented by the "net investment," the government would only have to pay "just compensation" as determined by the courts.

Thus, it is shown that one of the three principal differences which formerly existed between Senate and House has been entirely eliminated and a basis for prompt and equitable adjustment has been provided for the other two.

The other principal differences in the bills now in conference are as follows: First, proposed federal power commission; second, amortization, and, third, renewal of license. As to these the following may be said:

First, the Senate bill covers only navigable streams and empowers the Secretary of War to issue permits for water-power developments which are made in connection with navigation improvements. The House bill creates a federal power commission consisting of the Secretaries of War, the Interior and Agriculture, giving it authority to issue licenses for water-power developments in navigable streams, in the national forests and in the public domain, thus assembling under one authority jurisdiction over all phases of water-power development. As the scope of the work of the commission is intended to include investigation of all the hydro-

electric possibilities of the United States, it would seem as though the coördination of the three great departments of the government in supervision of the development of the nation's greatest resource would tend to promote a degree of efficiency and economy that could not be obtained if the three departments were to work separately in issuing permits for development of the water powers under their jurisdiction.

Second, the House bill provides for establishment of amortization reserves, while the Senate bill has no such provision.

The sole reason for amortization, it is pointed out, is that the cost of the property, if purchased by the government, after fifty years, should be lessened by the amount amortized. The cost of amortization must of necessity come out of the consumer of electricity in the form of added charges. Thus the question to be settled is, Shall the cost of amortization be borne by the present generation for the benefit of those who come after?

The building of hydroelectric systems never stops, it is pointed out. Additions to capacity, new machinery, new requirements of many kinds call continually for new capital. Power companies cannot borrow the full amount required for these expenditures, and they rely upon earnings to make up the portion that cannot be borrowed. Many believe that no portion of earnings should be required to be set aside for amortization reserves during the first ten lean years of operation. After that, it is pointed out, the operator could, if required, probably set aside say not to exceed 25 cents per horsepower per annum for amortization purposes; but to do so would be at the cost of the present-day consumer in additional charge for electric energy.

Third, the Senate bill provides that after the termination of the license the licensee may continue the operation of the property under the terms of the original lease until the government either purchases it for itself or for a new licensee or grants a new license to the original licensee or to a new licensee. The House bill abruptly terminates the right to the original licensee to operate the property after fifty years, thus leaving him a tresspasser upon his own property pending the time that the property is purchased or a new license issued. It is said in Washington that it is so manifest that this clause in the House bill must be remedied if any develoments are to take place that the House conferees will undoubtedly yield the point.

There are other minor differences between the Senate and House bills, but they are of a technical nature and should be easy of adjustment.

The water-power bill passed the United States Senate Dec. 14, 1917, and the House of Representatives Sept. 5, 1918, and was then sent to conference in order that the differences between the Senate and House bills might be adjusted. The conferees, who are among the most able men of the Senate and House, are:

Senators—John K. Shields of Tennessee, chairman; John H. Bankhead of Alabama, Knute Nelson of Minnesota, Henry L. Myers of Montana, Key Pittman of Nevada, Reed Smoot of Utah.

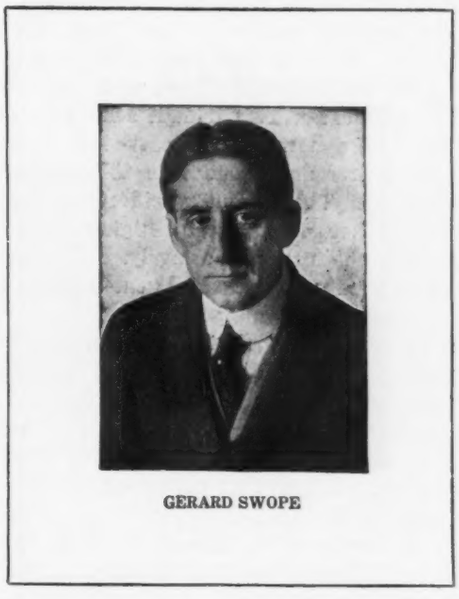
Representatives—Theus W. Sims of Tennessee, chairman; Scott Ferris of Oklahoma, Asbury F. Lever of South Carolina, John J. Esch of Wisconsin, William L. Lafollette of Washington, Gilbert N. Haugen of Iowa.

Senator Shields is momentarily expected back in Washington, and it is known that his colleagues on the conference committee are awaiting only his arrival or the receipt of his views before attempting to reconcile the opposing views of the House and Senate bills, which might be done along the lines above suggested.

FORMING NEW INTERNATIONAL GENERAL ELECTRIC COMPANY

Gerard Swope to Become President of a General Electric Company Foreign Trade Subsidiary—Charles Neave Chairman of the Board

A new corporation, probably bearing the title of the International General Electric Company, will be formed as a subsidiary of the General Electric Company to develop foreign trade. Gerard Swope has resigned as vice-president of the Western Electric Company to become the president of the new organization. Charles Neave of Fish, Richardson & Neave, attorneys, will be chairman of the board. M. A. Oudin, manager of the foreign department of the General Electric Company, will be vice-president of the new company.



GERARD SWOPE

At present the General Electric Company has a well-developed selling organization with offices in many parts of the world and separate subsidiary companies in South America and in other quarters of the globe. While the plans for the new organization are not fully made, it will be a large company.

Mr. Swope, who is announced as the president of the new company, was graduated from the Massachusetts Institute of Technology in 1895 and in the same year entered the employ of the Western Electric Company at Chicago. After spending a year in various departments of the shops he became designing engineer in the power apparatus engineering department. In January, 1901, he organized the St. Louis branch and was its first manager. He was transferred to Chicago in 1906 as power apparatus manager. Two years later he was made general sales manager with headquarters in New York. He was elected vice-president in 1913.

WELDING BY ELECTRICITY IN SHIPBUILDING INDUSTRY

Comfort A. Adams, President of A. I. E. E., Outlines Activities of Institute Committees and Gives Facts About Welding Practice

Speaking before a joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the electrical section of the Western Society of Engineers at Chicago on Dec. 30, Comfort A. Adams, president of the American Institute of Electrical Engineers, gave some first-hand information concerning the use of electric welding in shipbuilding. He first outlined the history of the activities of those committees of the American Institute of Electrical Engineers which have assisted in the development of electric welding practice in the shipbuilding industry. He predicted that the life of the Emergency Fleet Corporation will be shorter than is generally supposed, which, of course, means that the future work of the American Institute committee is also doomed to be short-lived. The speaker stated unofficially that the committee is planning to publish a full account of its work some time in February. This publication may include something about the development of a new type of cast-steel anchor chain which is the first development in this particular line for many years. The present specifications for the new anchor chain are 40 per cent higher than for the wrought-iron chain used formerly. The quality of this chain is produced by careful heat-treating in which electric furnaces play some part.

Electric welding as applied to shipbuilding is of two sorts, namely, arc welding and spot welding. The phenomena surrounding the passing of the metal across the arc in arc welding are not fully understood, and on this point there is opportunity for considerable research work. The speaker expressed the opinion that in arc welding the major factor to be considered is the skill of the operator. He stated that, in spite of the claims of the various manufacturers, the type of current regulation employed is of comparatively small importance as long as it is possible for the operator to hold the arc. Tests of fifteen different makes of equipment showed almost no appreciable difference in the strength of the welds produced. All of these welds showed at least strength 94 per cent as great as was possessed by the plate itself. Apparently it makes no difference whether the arc is produced by alternating current or by direct current. It is apparent, however, that there is some definite relation between the current strength employed and the resulting tensile strength of the weld. Tests show a consistent tendency for stronger current to produce stronger welds. The tensile strength is also a function of the kind of plate employed.

Apparently, however, it makes no difference whether the electrode used is of absolutely pure iron or of a type of iron containing impurities, since the characteristics of the metal apparently change in going across the arc. In the investigating of all these phenomena there is an opportunity for much research. At present tests are being made to determine the effect of vibration to decide whether metal in welded ships will fail through fatigue. In making any of these tests the work required is enormous on account of the great number of variables involved. In making one set of tests now under way the committee is using 20 tons of samples.

The cost of arc-welding apparatus now varies from $100 to $1,200 for the direct-current units and is around $600 for alternating-current units. The efficiencies of almost all of these sets, the speaker said, are comparatively low. For appreciation of the importance of arc welding, however, it should be understood that with riveting the efficiency of a joint can only be from 50 per cent to 70 per cent, depending upon whether one, two or three lines of rivets are employed, while with electric welding joints which are 94 per cent efficient can be consistently made.

Spot welding is very different from arc welding in that very heavy machinery is required. For welding ½-in. (1.25-cm.) plate the equipment required will weigh about 3 tons and will utilize about 30,000 amp. at 3 volts to 3½ volts. The time of making the weld of course varies with the strength of the current. As compared with arc welding, spot welding requires less time and less labor but more power. This machinery must necessarily be heavy because it is necessary to produce pressures around 25 tons on the plates which are to be welded if ½-in. stock is being worked and electrical ratings around 400 kw. are employed. On account of these facts the application of spot welding is more or less limited. The largest commercial spot welder is now rated at 700 kw. It is the largest in the world except for an experimental machine rated at 2000 kw. Since these machines all operate on single-phase energy, it is usual practice to supply this power through a motor-generator set with a three-phase motor and a single-phase generator, steadied in its action by a large flywheel that will take up a part of the fifteen-second peak usually occurring with welding.

As for the success of electric welding in shipbuilding, the speaker appeared very optimistic. The approval of the Classification Society, which passes on vessels before they are insured, has been secured for arc welding for the minor parts of ships, of which there are about 500,000 on each of the ordinary ships produced in yards like Hog Island. He pointed out that the saving on the first 125-ft. (38-m.) barge which was built completely by electric welding was about 20 per cent over riveted barges of the same character built in the same yard. He also pointed out that it required only about one-tenth of the time to repair the German ships by the electric welding processes that would have been required to put them in shape by any other process.

Perhaps the strongest argument for the adoption of electric-welding processes in shipbuilding is to be found in the comparative cost figures for constructing American ships and English ships. At present it costs America's shipbuilders about $200 per dead-weight ton, while English yards have recently offered to produce all of the ships America desires at a cost of $100 per dead-weight ton for the completed ship. With such facts apparent it must seem necessary for American shipbuilders to adopt every possible means of effecting economies that may be discovered. Since electric welding requires the use of less steel, produces vessels of less weight and hence of greater storage capacity, and effects a considerable saving in labor, electric welding may be a factor in reducing the cost of ships.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electric Club of Chicago.—At the weekly meeting of the Electric Club of Chicago held on Dec. 26 Prof. Ralph B. Dennis of Northwestern University gave a talk on "Russia in Revolution."

Electric League of Cleveland.—"Hog Island—Its Relation to American Merchant Marine" was the subject of a talk by John Penton of the Penton Publishing Company, given before the Jan. 2 meeting of the Electrical League of Cleveland.

A. I. E. E., Detroit-Ann Arbor Section.—A paper by Prof. H. H. Higbie of the University of Michigan on "Alternating-Current Circuits" was the feature of the meeting held on Dec. 27 by the Detroit-Ann Arbor Section of the American Institute of Electrical Engineers.

A. I. E. E., Schenectady Section.—C. A. Kelsey of the power and mining engineering department of the General Electric Company addressed the Jan. 3 meeting of the Schenectady Section, American Institute of Electrical Engineers, on "The Sugar Industry," his lecture being illustrated by lantern slides and moving pictures.

A. I. E. E., New York Section.—Under the auspices of the American Institute of Electrical Engineers a lecture was given on Friday evening, Jan. 10, in the Engineering Societies Building, New York City, by Major-General George O. Squier, Chief Signal Officer of the United States Army, on "Aeronautics in the United States from the Beginning of the War to the Present Time." The lecture was illustrated by motion pictures.

A. I. E. E., Cleveland Section.—At the Dec. 16 meeting of the Cleveland Section, American Institute of Electrical Engineers, held in Nela Park, John E. Randall of the National Electric Lamp Works gave a talk on the history and development of incandescent electric lamps. Lantern slides were used to illustrate the talk, and a motion picture showing the process of lamp manufacturing from the raw material to the finished bulb was shown.

I. E. S., New England Section A. I. E. E., Boston Section.—A unity meeting was held by the New England Section of the Illuminating Engineering Society and the Boston Section of the American Institute of Electrical Engineers on Jan. 7. M. Luckiesh, of the Nela Research Laboratory and chairman of the camouflage committee of the National Research Council, gave an illustrated talk on "The Principles of Camouflage for Land, Sea and Air."

A. I. E. E., Detroit-Ann Arbor Section.—H. D. James of the Westinghouse Electric & Manufacturing Company was the speaker at the Jan. 10 meeting of the Detroit-Ann Arbor Section, American Institute of Electrical Engineers, giving a talk on "The Development of the Industrial Controller," illustrated by lantern slides showing the history of present-type controllers and the advantages of various designs.

I. E. S., New York Section.—Following an informal dinner held by the New York Section of the Illuminating Engineering Society on Jan. 9 papers were presented by Clifton W. Wilder and Albert F. Allen, Public Service Commission of New York, First District, on "Urban Rapid Transit Lighting," and by W. F. Little and A. C. Dick, Electrical Testing Laboratories, on "Illuminating Notes—Intensities in Hotel Rooms."

Wisconsin State Association of Electrical Contractors and Dealers.—The annual state convention of the Wisconsin State Association of Electrical Contractors and Dealers will be held at the Hotel Pfister in Milwaukee on March 24, 25 and 26. A trade exhibit will be conducted in connection with this meeting, to which a considerable number of manufacturers, jobbers and dealers have already pledged their support. Detailed information regarding the plans may be obtained from John A. Piepkorn, 108 Sycamore Street, Milwaukee, Wis.

San Francisco Electrical Development League.—The Nov. 25 meeting of the San Francisco Electrical Development League was "Old Timers' Day," almost a score of the 135 members present having been in the electrical industry more than thirty years and three having had more than forty years of work to their credit. These latter were Samuel H. Taylor, John A. Britton and Frank Smith. Some of those who reviewed experiences of the early days in the industry were John B. Miller, John A. Britton, Dr. Thomas Addison, A. G. Wishon, Samuel H. Taylor, E. B. Strong, Frank Smith, F. J. Cram and S. Ickelheimer.

American Society of Civil Engineers.—The sixty-sixth annual meeting of the American Society of Civil Engineers will be held on Jan. 15 and 16 in the Engineering Societies Building, New York City. The program for the first day includes the election of officers, business sessions and a luncheon. Brigadier-General R. C. Marshall, Jr., U. S. A., will give an illustrated address at the afternoon session about construction work carried on in this country during the war. A reception to the president will be held in the evening at the Biltmore. On Thursday the society will visit the Brooklyn army supply base and the Newark Bay shipyard of the Submarine Boat Corporation, while in the evening Brigadier-General S. A. Ansell will speak on "War and the American Soldier," followed by an informal smoker.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Service Charge Upheld.—That a service charge is proper as a means of insuring that no individual gas or electric utility customer is served at an actual loss to the company was set forth by the New Hampshire Public Service Commission in a gas rate case, its comments being in part as follows: "The service or ready-to-serve charge is generally regarded by students of utility rates as preferable to the minimum charge, but there is a wide difference of opinion as to how much of the fixed costs should be included in the service charge. To the average user the size of the service charge is not important as a large service charge involves a correspondingly small price and vice versa. With a given plant, interest on the investment and taxes does not depend upon the amount of service rendered, and this is largely true of depreciation, and generally the output may be largely increased without anything like a proportional increase in the cost of operation. It has been found in some instances that the output and capacity costs are about equal. In such cases it would be theoretically correct to assess one-half the costs of operation on the basis of the demand or meter capacity, and the other half on the basis of the amount of service actually rendered. This is a fair and logical basis for rates and would be the best method were the cost of rendering the service the only factor to be considered. But the two extremes, the very large and the very small users, require special attention as the value of the service is often the controlling factor in these cases. The very small user will not take a particular kind of service if it costs him more than would some other equivalent service. The same is true also of the very large user, with the additional feature that he may be able to set up his own plant and is therefore independent. . . . The possible consumer determines what he can afford to buy rather than supply himself, or how much he can afford to pay and set up a manufacturing or other business in a particular locality with a prospect of successfully competing with others. It is then the vital question to the utility whether the proposed low price will give some margin beyond out-of-pocket cost of rendering the service. The best and fairest way to secure such a responsibility on the part of every customer is by the use of a service charge which shall be only sufficient to make sure that no individual consumer is served at an actual loss to the company."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Engineering Award to Hoover.—The Washington award established by the fund provided by John W. Alvord of Chicago has been bestowed by the Western Society of Engineers of Chicago on Herbert C. Hoover for distinguished engineering and human service during the past year.

A Summary of Illinois Rate Cases.—The Illinois State Electric Association has issued a bulletin summarizing all the rate cases which came before the Public Utilities Commission of Illinois between the dates of Jan. 1, 1918, and Nov. 1, 1918. The bulletin gives the number assigned to the case by the Public Utility Commission, the name of the company involved, the locality in which it operates, the class of service under consideration, the date of the commission's order, and remarks on the finding of the commission in each case. Similar information regarding all gas cases handled by the Public Utilities Commission of Illinois in 1918 is also contained in the supplement.

Municipal Lighting Department Increases Rate.—An advance in the net lighting rate from 10 to 12 cents per kilowatt-hour, effective Jan. 20, has been announced by the municipal gas and electric lighting department of Wakefield, Mass. Gas rates are also to go up from $1.20 to $1.35 net per 1000 cu.ft. The town purchases its electricity from the Edison Electric Illuminating Company of Boston and distributes it locally. An advance in the Edison wholesale rate took effect Oct. 1, 1918, and in an announcement to the public the municipal lighting department of Wakefield called attention to the increased cost of labor and materials as the necessary cause of the advancing price.

Copper Production for 1918.—The production of copper in the United States in 1918 was slightly larger than in 1917, according to preliminary figures and estimates collected by B. S. Butler of the United States Geological Survey, Department of the Interior, from all plants that make blister copper from domestic ores or that produce refined copper. At an average price of about 24.75 cents a pound the output for 1918 has a value of $473,000,000, as against values of $510,000,000 for 1917 and $190,000,000 for 1913. The supply of refined copper (electrolytic, Lake, casting and pig) from primary sources, domestic and foreign, for 1918 is estimated at 2,450,000,000 lb. compared with 2,362,000,000 lb. for 1917 and 1,615,000,000 lb. for 1913.

Commission Orders Temporary Increase.—The Illinois Public Utilities Commission has ordered the Rankin Electric Company to increase its general lighting and power service rates until Dec. 1, 1919. The top step of the rate is 20 cents per kilowatt-hour for the first 20 kw.-hr. used per month. On a sliding scale the cost declines to 8 cents per kilowatt-hour for all energy over 350 kw.-hr. per month gross. A prompt-payment discount of 1 cent per kilowatt-hour is stipulated. The minimum bill is to be $1 a month.

Lead and Zinc in 1918.—The domestic mine output of lead and zinc decreased in 1918, according to C. E. Siebenthal, in a statement issued by the United States Geological Survey, Department of the Interior. The lead and the recoverable zinc of ores mined was approximately 563,000 tons and 627,000 tons, as compared with 651,156 tons and 711,192 tons in 1917. The average price of lead at New York was 7.6 cents a pound and of spelter at St. Louis 8 cents a pound.

Demobilization and Peace Training at Stevens.—With demobilization of the army and navy units of the Students' Army Training Corps at Stevens Institute of Technology, Hoboken, N. J., completed, there are left nearly 500 men who will go on with the regular mechanical engineering course, only about seventy having withdrawn. This is regarded as an exceptional record and leaves the total college attendance close to the highest record of previous years, which was 520. Even this may be surpassed by the return of men who left in the early days of the war.

Doing Honor to Veterans of the Edison Service.—Gray-haired annuitants were the guests of honor at a luncheon given by the Commonwealth Edison Company of Chicago on the last day of the old year. The beneficiaries of the company's service annuity system are retired employees who have earned the privilege of resting and are carried on the pension payroll of the company. A number of the executive officers, heads of departments and older employees were invited to meet these men and swap reminiscences. Eighty-five were in attendance. The luncheon and reception were given in the new rest room and refectory fitted up for women employees on the eighteenth floor of the Edison Building. The food was cooked by electricity and served by members of "Electra," an organization of women employees. Music was given by an orchestra of young men employed by the company. Letters were read from annuitants who were unable to be present, and a brief address was made by Samuel Insull, the president of the company. The service annuity system has been in existence for seven years. Employees make no contribution whatever to this fund, which is a voluntary recognition on the part of the Commonwealth Edison Company that long-time employees are entitled to some reward for faithful service in addition to their regular wages.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Death from Charged Street-Lamp Cable.—In an action against an electric light company for death due to contact with a charged cable used for the purpose of raising and lowering a street lamp, evidence was held by the Supreme Court of New York, Appellate Division, to show actionable negligence on part of the company, in Freedman versus Buffalo General Electric Company. The electric light company was not necessarily relieved from liability for death caused by contact with cable used for raising and lowering street lamp, which cable had become charged with electricity, by the fact that deceased of his own free act touched the cable without any knowledge of its dangerous condition.

Liability for Furnishing Appliances.—A city owning a light plant which furnished material and wired buildings for owner is subject to the same liabilities for neglect of wiring as any other electric contractor, according to the Supreme Court of North Carolina (97 S. 378). A city furnishing electric energy to bottling works and having installed wiring therein, but not furnishing lamp bulbs, is not liable for death caused by bottling works company's failure to screw the bulbs in far enough. The city was not liable for moist condition of floor nor for the placing of a belt and pulley and could not have foreseen that a metal soaker would be used as a stepladder in replacing the belt, thus requiring a different light socket for safety in handling light.

Safe-Place Doctrine.—A telephone company is not bound to furnish a lineman a reasonably safe place to work, as against dangers inherent in the work of repair, though it is liable if the danger arises incident to the place where the work is done, made dangerous by adjacent electric power wires, the Kansas City Court of Appeals held (206 S. W., 430). If a plasterer hired to mend broken telephone wire was ignorant of danger, the employer cannot escape liability on the ground that the safe-place doctrine is inapplicable. It is the duty of a telephone company specially hiring a plasterer to mend a broken wire which has fallen across power wires and become electrically charged to warn him of the danger. Where a telephone company for years permitted wires to be so strung that if they broke they would fall upon power wires and become electrically charged, it could not escape liability to a workman injured by such current on the ground of ignorance of the danger.

Charles F. Gray, consulting electrical engineer, has been elected Mayor of Winnipeg, Manitoba, by a majority of almost 5000. Mr. Gray is a member of the American Institute of Electrical Engineers.

J. Lee Pottes, formerly superintendent of the Amherst Gas Company, has been appointed successor to Charles S. Spaulding, resigned, as superintendent of the Newburyport (Mass.) Gas & Electric Company.

Charles L. Spaulding, for twenty years superintendent of the Newburyport (Mass.) Gas & Electric Company, has been appointed general manager of the Wakefield (Mass.) municipal light plant, succeeding Sidney L. Cole, who has resigned on account of his health.

C. W. Koiner, general manager and electrical engineer of the Pasadena (Cal.) light and power works, has returned to his regular duties at Pasadena after serving for a period in war work with the engineering section, power department, of the Emergency Fleet Corporation, looking after technical work and general power problems.

W. J. MacPherson, recently discharged from the army with the rank of captain, has been appointed superintendent of one of the divisions of the Public Service Company of Northern Illinois to succeed H. K. Mitchell, who resigned. Mr. MacPherson was superintendent of one of the public service company's plants before he joined the second officers' training camp.

H. R. Palmer, formerly general superintendent of the Virginia Railway & Power Company, operating in Richmond, Norfolk, Petersburg, etc., has been appointed general manager of the Harrisburg (Pa.) Light & Power Company, succeeding C. M. Kaltwasser, who has resigned to go into otner business. Mr. Palmer started in the public utility business in 1890 at Morristown, N. J., and in 1894 entered the employ of the Virginia company, with which he has been ever since. Mr. Palmer is a graduate of the New York State Normal School.

William W. Plattner, who for the last ten years has been superintendent of the North Attleboro (Mass.) Electric Light & Water Department, has resigned in order to devote his full attention to his duties as a member of the State Legislature. Mr. Plattner was born in Ohio in 1883 and for more than twenty years has been associated with public service work. Previous to his connection with the North Attleboro plant he was superintendent of the Board of Public Affairs at Bluffton, Ohio. Previous to that he was associated with the Commonwealth Edison Company, the Calumet Lighting Company, the Northwestern Elevated Railroad Company and the Milwaukee Electric Railway & Light Company. During the past eight years he has acted in addition as a consulting expert for various municipalities on matters taining to franchises, utility rates, etc.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

H. W. Clapp has been promoted from general superintendent to general manager of the Columbus (Ohio) Railway, Power & Light Company. Mr. Clapp was born in Australia and for four years before coming to America was superintendent of motive power of the Brisbane Tramways. In 1902 he became connected with the General Electric Company as engineer in the New York territory, and during his connection of five and one-half years with this company was intimately associated with the electrification of the New York Central Railroad. In 1907 he entered the electrical engineering department of the Southern Pacific Railroad. About four years later he became assistant electrical engineer in charge of construction of the Trans-Bay Electric Lines of the Southern Pacific Company. It was shortly after that that he resigned to become general superintendent of the Columbus system.

H. W. CLAPP

N. L. Snow, formerly vice-president and sales manager of the Terry Steam Turbine Company, Hartford, Conn., has been elected vice-president and general manager of that company.

James H. Wilkerson of Cook County, Ill., has been appointed a member of the State Public Utilities Commission of Illinois, having taken office on Jan. 1, to succeed Commissioner Sterling, who assumed the duties of State Treasurer at that time. Mr. Wilkerson is a former member of the Legislature and was United States District Attorney for the Northern District of Illinois during the term of President Taft. For two years he has been First Assistant Attorney-General of the state.

Charles Spaulding of Newburyport, Mass., has been appointed manager of the Wakefield (Mass.) municipal gas and electric department. The appointment became effective Jan. 1.

F. N. Boyer, district manager for the General Electric Company, with which he has had more than twenty-eight years of active service, has retired from active business life. Older men in the electrical industry will remember Mr. Boyer as general manager of the Edison Electric Light & Power Company of Reading, Pa., from 1884 to 1891 and as incandescent lamp specialist under John I. Beggs for the Edison General Electric Company in Chicago in 1891. Mr. Boyer was born at Reading, Pa., Sept. 9, 1855. Thirteen years later he entered the employ of the Philadelphia, Reading & Pottsville Telegraph Company as messenger boy and in 1869 was promoted to be telegraph operator. He was wire chief in charge of all telegraph wires of the Philadelphia & Reading Railroad Company from 1884 until 1891, when he entered the employ of the Edison General Electric Company. On Feb. 1, 1892, Mr. Boyer was appointed manager of incandescent lamps and of the wire and cable department. A few months later, when the General Electric Company was organized as a consolidation of the Edison and Thomson-Houston interests, this position was abolished and Mr. Boyer was made assistant manager of the supply department in Chicago, becoming Chicago manager of this department in 1895. In 1908, on the retirement of B. E. Sunny as manager of the Chicago district and the appointment of James W. Johnson as his successor, Mr. Boyer was appointed assistant district manager, and in 1912 he was made district manager for St. Louis. He is a member of the General Electric Quarter Century Club, the Old-Time Telegraphers' and Historical Association, the American Academy of Political and Social Science, the National Geographic Society, the American Asiatic Association, the Engineers' Club of St. Louis, the Jovians and many other organizations in St. Louis.

Obituary

Murray Copes Conley of the Lorain County Electric Company died at Elyria, Ohio, on Dec. 21.

Robert C. Bacon, former chairman of the Vermont Public Service Commission, died at Brattleboro, Vt., Jan. 2. Mr. Bacon was born at Washington, D. C., in 1874, and was educated at Dartmouth College and the Boston University and New York University law schools. He was admitted to the Vermont bar in 1899. In 1911 he was elected president of the Central New Hampshire Power Company of Maine, and in 1913 was appointed chairman of the Vermont commission by Governor Fletcher. After resigning from the board he was engaged in private law practice.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

FOREIGN INTEREST GROWS IN AMERICAN ELECTRICAL GOODS

Many Requests Are Being Received for Agencies in Europe, in the East and in South American Countries

Interest in American electrical goods is growing very rapidly in Europe, the Far East and South America. Each week a number of requests are received in this country for foreign agencies. The Italians are especially active in this connection. As a rule these foreign concerns do not handle electrical goods alone but in conjunction with a quantity of other merchandise.

There are also a number of representatives of foreign importing houses here wishing to handle American electrical goods abroad on a commission basis. Also, there are some foreign buyers in this country.

In most instances the foreign houses that wish sole representation are willing to buy the goods cash against shipping documents. Very few concerns are asking for credit.

$10,000,000 WORTH OF HEATING APPLIANCES SOLD IN 1918

In Actual Volume the Production of Last Year Was in the Neighborhood of Twice the Production for 1914

From being what was popularly known as a specialty a few years ago the electric heating device has pushed ahead until the business is now one of the leaders in the electrical field. Accurate figures are not available, but estimates by those in a position to be best informed place the total output of electrical heating devices for 1918 at $10,000,000. Of this about $8,000,000 probably represents the production of domestic appliances and $2,000,000 the production of industrial devices.

Figures from the reports of the census give the comparable output for 1914 as $3,500,000 roughly and $1,600,000 for 1909. However, in making comparisons it must be remembered that 1918 prices were on the average from 50 to 75 per cent higher than those that prevailed before the war. With this in mind, it is probably true that the volume of the 1918 output was somewhere double that for 1914.

The demand last year, on the other hand, was much greater than the supply. Some careful estimates place at $13,000,000 what would have been the probable 1918 output had it been possible to obtain sufficient raw materials and labor. Furthermore, there are many who state that the high prices prevented numerous sales. It is doubtful if the curtailment program in any way reduced the output of heating devices. The war was over before this measure of conservation had a chance to become effective.

Manufacturers appear to be optimistic over the outlook for the year, especially for the development of range sales. During the past year the electric range had many unfavorable conditions, not of its own making, to meet. These, it is understood, are being removed, and an excellent year is expected.

Many developments are in the process of perfecting, and some new types are about to be brought out.

Standardization is expected to make rapid strides this year, and it has been intimated that standards of appliance plugs and receptacles can be expected. This has been wished for for many years, but the manufacturers have not been able to come to any agreement. A committee of the National Electric Light Association has been trying to bring about some standards in this connection, but there is still a very great number of different types.

JOBBERS ARE NO LONGER KEEPING LARGE STOCKS

Now That Deliveries Are Better Supply Men Will Again Make Shipment on Large Orders from Manufacturers' Stock

On large orders jobbers prior to the war as a rule made shipments from manufacturers' stocks. The stocks carried by the jobber were utilized to take care of the every-day local retail stock replenishment and small building needs.

When, however, deliveries became very undependable, the jobber saw the necessity of increasing stock so as to be able to serve from stock any of his customers. It was not uncommon during the past year for a jobber to deliver 3000 ft. to 4000 ft. of iron conduit out of his own stock.

Conditions, however, are again swinging back toward normal, and jobbers are again reducing stocks. This does not mean that stocks are going to be allowed to run down. Rather does it mean that manufacturers' stocks are again going to be drawn on for large orders. Local stocks will be kept up to the extent necessary to satisfy the immediate local demand with a sufficient margin of safety. The savings that will result to the jobber are by no means small.

Conduit stocks are rapidly getting into shape. Wire stocks are much better, and unless incoming shipments are reduced or a larger volume of business placed there may result some cases of an overstock of wire. Moreover, manufacturers of appliances may find difficulty in persuading jobbers to stock up early. This will not apply so strongly to lamps because the jobber has no stock investment.

LARGE SYNCHRONOUS MOTORS ARE NOW IN GOOD DEMAND

Orders for the Smaller Sizes Are No Longer Coming in for Large Quantities—Inquiries Are Picking Up Steadily

Motor sales have been falling off for the past two months. This was to be expected. Nevertheless, a very satisfactory volume of business is being placed. Not all lines of industry are buying, to be sure, but then again in some instances industries that were curtailed as a conservation measure are now in the market.

Current sales are for a smaller number of motors than were called for a few months ago. Then it was no uncommon thing to get requests for forty or more motors on a single order. Now orders are for a much smaller number.

A number of sales of large synchronous motors have been made in the last few days. The demand for large induction motors, however, is very small. Shipments of the former can be made in a few weeks, but large induction

motors can be had only in five months. This is better by two months than the time which the manufacturers quoted in October last.

Stocks of small motors are rapidly being built up, although they are still very spotty. Stocks of 3-hp, motors of one manufacturer, for instance, are still very low owing to the large demand that has been made for this size. Generally speaking, however, motors up to 50 hp. can now be obtained readily out of stock in quantities sufficient to satisfy any reasonable demand that might be expected at the present time.

Direct-current stocks are low, it is reported. Before the war efforts were made to use the alternating-current motor everywhere. As a result the sale of direct-current motors fell away down. Since the war started the direct-current demand has come up by leaps and bounds. From now on, however, direct-current sales are not expected to be nearly as large.

Motor prices show no tendency as yet to weaken. The drop in iron and steel prices would hardly be expected to affect motors, but the combination of this with the drop in copper has raised the question of a probable lower motor price. Manufacturers, however, point to their stocks of raw material, laid in when prices were high, and to their labor costs, which have not come down, and they ask if buyers are justified in holding out for lower prices. One Middle Western concern stated early in the week that it was hard to see how prices could be lower for at least three months to come—possibly longer.

METAL MARKET SITUATION

Copper Production Being Cut as a Result of a Lull in Buying That Has Taken Place

The dullness that has characterized the past few weeks is still hanging over the market. Prices are being jockeyed about in an attempt to find a level on which business can be done.

Copper is lower than it was. Some of the producers have already begun to curtail production, both of the raw product and of the refined metal. As the price goes down other mines will have to close because it will be unprofitable to do business. Wire base, which apparently advanced a cent a pound this week, practically receded from its high price of a few weeks ago many points.

Tin is still quiet. Indications pointed this week to the probable absorption before very many weeks of the government stocks.

Dealing in other metals was more or less spotty. There is no demand apparently for scrap metal. Dealers are holding back waiting to see what the future will bring forth.

Prices in the past week stayed remarkably steady, but the tendency was to weaken.

NEW YORK METAL MARKET PRICES

	Dec. 30	Jan. 7
Copper:	£ s d	£ s d
London, standard spot	112 0 0	96 0 0
	Cents per Pound	Cents per Pound
Prime Lake	23.00	23.00
Electrolytic	23.00	20.62½
Casting	23.00	19.00
Wire base	28.75	29.75
Lead, trust price	6.00	6.00
Antimony	7.62½	7.75
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	13.00	13.00
Spelter, spot	8.15	7.90
Tin	Govt. price 72.50	Govt. price 72.50
Aluminum, 98 to 99 per cent	Govt. price 33.10	Govt. price 33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	16.00 to 16.50	16.00 to 16.50
Brass, heavy	9.00 to 9.50	9.00 to 9.50
Brass, light	8.00 to 8.25	7.50 to 8.00
Lead, heavy	4.50 to 4.75	4.50 to 4.75
Zinc, old scrap	4.75 to 5.00	4.75 to 5.00

THE WEEK
IN TRADE

CUSTOMARY winter dullness continues. Few orders are being placed, but inquiries seem to be getting better. A larger volume of business is confidently expected to develop before long.

Except for wire, which dropped about 20 per cent, the market is exceptionally free from changes. One increase—namely, 25 per cent or more on fans—is reported.

Local stocks are being filled by shipments on back orders, many of which had no cancellation clause. Deliveries are much better everywhere, but especially so west of the Mississippi. The mild and open winter has been very helpful in this respect.

It is interesting to notice the rapidity with which the ranks of salesmen are being filled up. The industry is again actively soliciting business where a few weeks ago buying was discouraged and no new business desired.

NEW YORK

While there is very little incoming business, every one seems very optimistic and there is a genuine feeling that big business is on its way. This season as a rule is quiet, and the local distributers see no reason for feeling blue just because things aren't steaming along at a high rate of speed.

Prices are holding remarkably firm. Wire is about 20 per cent lower owing to the lower price of copper, but other commodities have not reflected the drop yet.

There is little that can be said. Shipments are coming in on back orders and are going into stock. Jobbers are not placing any orders for the present. All along the line there is just at present a hesitancy to do much in the way of building, as better prices are expected. The drop in price of steel and copper has led buyers to expect a corresponding revision of prices of finished products. There is a growing volume of new building under estimate. Some municipal projects are contemplated, including a rather comprehensive school-building campaign.

MOTORS.—Published prices show no change, but here and there where stocks are large and the business good salesmen are cutting under somewhat to make a quick sale. Inquiries are better than they have been.

CONDUIT.—Although plumbers' pipe decreased 3 points in price on Jan. 1, no change has been made, so far as could be learned on going to press, in the quotation for rigid-iron conduit.

HEATING APPLIANCES.—Local stocks are picking up rapidly. The shortage of irons and heaters in distributers' stocks is expected to be cleared up this week. In some places an overstock is developing. Dry-goods stores are cutting prices to clean up stock left over from Christmas trade. The cold weather has made some demand, it is reported, on heater stocks. Some business on all lines is coming in. No central-station campaign contracts have yet been placed, so far as could be learned.

FANS.—The new price lists made their appearance in New York this week and show, on the whole, an increase of around 20 per cent on the desk and oscillating types and 25 per cent on the ceiling fans. This, however, is by no means so large an advance as had previously been decided upon. Had war continued the advance would probably have at least 35 per cent.

WIRE.—As a result of the drop in copper price wire has fallen many points. Of ten prominent manufacturers three were quoting on Monday 27 cent base on rubber-covered, two 28 cents, four 30 cents, and one 32 cents. Considering

discounts, however, rubber-covered base is probably between 27 and 28 cents, a drop of six to seven points. Quite recently one or two manufacturers have stopped selling on base, and they are now selling on cost.

ARMORED CONDUCTOR.—The prices current on Tuesday for No. 14 two-wire Realflex, full coil, was $70 per 1000 ft.; other sizes and kinds, 35 per cent discount; armored lead conductor, 35 per cent discount, and lead and armored cable, 28 per cent off.

SCHEDULE MATERIAL.—There has been considerable speculation locally regarding the effect of lower copper prices on sockets, switches, etc. Prices, however, are remaining firm, and representatives of the factories say that it is hard to see how prices can be lowered at present. Copper for current production was purchased at the high prices, and labor is still as costly as ever.

CHICAGO

Inventories, the closing of books, sales conferences and other usual first-of-the-year activities have combined to make this a quiet week. Events continue to indicate, however, that the next business will come from the central stations. The Commonwealth Edison Company has applied to the Public Utilities Commission of Illinois for authoirty to issue $4,000,000 of first-mortgage bonds. The Public Service Company of Northern Illinois is selling a bond issue, and the Michigan Light Company, a constituent company with the Commonwealth Power, Railway & Light Company, is offering $700,000 of 5 per cent bonds. Jobbers are watching this situation carefully. When one of them received an order this week from a central station for 500 large cross-arms he was particularly elated since it indicated that something in the way of a real buying movement is starting.

The railroads also are looked upon as a source of large business in 1919. Inquiries which are now out for material seem to presage a heavier volume of business from the railroads in 1919 than has come from them in many years. Some of Chicago's larger industrial plants are going ahead buying, but this demand on the whole is not what it has been.

Prices have not yet yielded materially. Except for copper there has been no serious decline. Certain kinds of steel have been reduced, but this may not have a great effect in the electrical trade.

Stocks of material in jobbers' hands are now adequate. If any particular jobber is short on any item, it is probably through his own neglect.

CONDUIT.—There was no change in the price of conduit on Jan. 1 as had been expected.

COPPER WIRE.—Since the drop in copper prices was announced the wire market has been engaged in a "spreading-out process." All prices were pretty well in line before that time and will no doubt again reach a common level soon. Just now bare copper wire is quoted at from 25 cents to 26 cents, weatherproof wire ranges from 28 cents to 29 cents, and rubber-covered wire has a spread of 3 cents a pound, ranging from 32 cents to 29 cents in one case.

SCHEDULE MATERIAL.—If the expected building boom comes in the spring, the jobbers will be found to have ample stocks of schedule material.

INCANDESCENT LAMPS.—Nearly every one reports that lamp sales are of good volume.

BOSTON

Trade still reflects a waiting attitude on the part of the public with sound underlying conditions. Prices are fairly steady, though here and there there is a tendency toward reduction in order to maintain material movement. An excellent holiday trade in appliances is reported. A beginning in building construction is evidenced by applications for permits in various cities. The Poli interests are about to build a new theater at Hartford, Conn., costing about $250,000 equipped. Three public garages, to cost about $150,000, are scheduled for early construction at Worcester, Mass. Contracts totaling over $382,000 have been awarded by the Ordnance Department at Washington to Worcester manufacturers. Electrical contractors are doing more estimating than for some time, and not a little mill reconstruction is in progress. Stock increases are in contemplation by one or two Massachusetts central stations, and a relaxation of regulations regarding financing electric extensions is also under consideration in public utility circles, though no general break in policies is expected at this time. Collections are still a little slow. Deliveries are improving in most lines, and stocks are in excellent condition as a rule. Labor conditions are easier, and work has been resumed generally at the Pittsfield works of the General Electric Company, following the strike to which reference was made in previous issues. The company has reclassified its employment schedule and has so far declined to take back many of the strikers.

CONTROLLING EQUIPMENT.—The demand is increasing for apparatus in the smaller sizes. The market for large equipment is quiet. Prices hold firm and deliveries are improving.

INDUSTRIAL ELECTRIC TRUCKS.—Prices are about the same. Deliveries are reasonably good, and inquiries and sales hold up well. The high cost of labor is a vital factor in the success of this class of equipment. Some difficulty is reported in securing motors promptly for truck service, and this seems to be largely a matter of transportation congestion. To overcome this delay one of the leading makers of industrial trucks recently sent a man to the motor factory and checked the motors back to the truck factory.

STORAGE BATTERIES.—The demand for automobile batteries is excellent. Stocks are increasing, although there are still gaps which cause annoyance in local stores. Prices are expected to remain firm for the present.

FIXTURES.—The portable-lamp business of the holiday period is reported better than in 1917 by a leading dealer, and a brisk trade was enjoyed by retailers in this line at Christmas time. A fair year-around business in portables is developing, with silk floor lamps showing great popularity at this time. The fixture market is still rather quiet, but the outlook is better than of late. The mills are not able to stock up much. Prices are holding firm.

INSULATING FIBER.—Raw material is freer, and manufacturers of the vulcanized type with cotton base are in better shape to make deliveries. The domestic and government demands are both reduced. Prices are steady, and sales managers are looking expectantly toward foreign markets.

HOUSE WIRING.—Contractors are doing more or less house wiring now at Bath, Me., Worcester, Mass., and Concord, N. H. A much larger business in this line is anticipated in the late winter or early spring.

MOTORS.—Factory stocks are not increasing very fast, and prices are somewhat erratic. The demand is spotty at present, and stocks are uneven. The smaller sizes up to 50 hp. are now fairly easy to obtain for immediate delivery. Labor is getting easier.

VACUUM CLEANERS.—Manufacturers, jobbers and retailers are doing a rushing business. One Massachusetts factory reports that it is so far behind on orders that it is working nights. One of its distributers reported not a cleaner on his floor a few days ago. No price changes are expected for the present. Factory labor and material supply are reported plentiful. Manufacturers will soon complete their war contract work and be able to devote their entire production energies to their regular products.

WIRE.—Prices are shading downward by 2 to 3 cents per pound, compared with a fortnight or so ago. Buying is light and factory stocks are increasing.

INDUSTRIAL SWITCHBOARDS.—Government orders are falling off and domestic business is at present rather dull. Labor is easier and lower prices are anticipated before long in some circles.

ATLANTA

The present outlook is bright for a revival of building operations. Meager reports from a few cities show that a number of building permits have been issued covering a substantial volume of construction. Contractors are of the opinion that if material prices do drop off it will be a very gradual decline and that wages will remain at the present standard for some time to come. On the other hand, a great deal of uncertainty exists as to the outcome of building for government account. The hopes of a number of towns and cities for new government buildings appear to be blasted. Construction work has been held up since 1914 on some buildings, and on all sides since the United States entered the war. And now, according to Treasury officials, high cost of materials apparently will prohibit contractors from bidding for the jobs at the prices fixed by the government. A few by scaling down the plans can be brought within the limits.

The spirit of optimism which now prevails among the building interests is reflected to some extent to the electrical jobbers and manufacturers. One jobber, whose volume of sales for 1918 exceeded that for 1917 by 40 per cent, has comprehensive plans for a year of great activity. Soon after the armistice was signed a number of buyers shut off on all purchases, awaiting a big slump in prices, but this policy of hesitancy has vanished more or less and purchases are being made more freely. On the whole, the dealers are looking forward to a good business during the year and are filling in on their normal sixty-day stocks. Holiday sales were away above expectations.

The army supply base at New Orleans will cost about $15,000,000. This, together with municipal belt lines, grain elevators and wharves, will total approximately $27,000,000. Some expansion is noted in the textile industry as indicated by new structures and additions. The Model Mill, Spartanburg, S. C., will be equipped throughout with electric drive. The Georgia Railroad Commission has granted an increase in street-car fares from 5 to 6 cents for Rome and Athens and an increase in electric light and power rates for the Athens, Rome & Panola Light & Power Company, at Conyers and Lithonia, Ga.

SOCKET APPLIANCES.—The volume of sales in washing machines is increasing month by month. For a time shipments were curtailed, but deliveries are improving. New dealers are not looking for any sharp decline and are buying quite freely. Vacuum-cleaner sales for this season are very satisfactory. Deliveries are getting better. Prices are firm. Dealers report an excellent business in flatirons. The present cold wave has exhausted local stocks of radio heaters. There has been a standing demand during the past two winters which the manufacturers and dealers have been unable to supply. The dealers who have been fortunate enough to secure reasonable quantities of heaters have made quick turnovers and substantial profits.

FLASHLAMPS.—The holiday demand has not diminished, and transactions are being handled that exceed by far anything compared with the same period a year ago. Battery shipments have reached the point where very little difficulty is being experienced, and reshipments are going forward in good time.

SEATTLE—PORTLAND

Business is comparatively quiet with both jobber and dealer, the usual low after-holiday sales being experienced. Jobbers are closing up the books for the year, and while the actual results of the year's business have not been announced, it is safe to say that the volume in the aggregate will exceed by far any previous year in the Northwest. In spite of decrease in sales both jobbers and dealers feel but little apprehension as regards the future.

Many prospects are reported by electrical contractors for new and reconstruction work. Demand for substantial residences continues unabated, and the indications point to renewed activity in residence building. Tacoma reports that residence building has shown no material falling off during the past month, and announcements of construction of new residences are being made daily. Reports from Portland state that business for the holiday week was good, but conditions in the electrical field have very materially slowed up since that time. The past week has been largely given over to inventory work, and there is little to report in the line of new business. Recently the commission of public docks of Portland opened bids on wiring of one section of the new municipal docks that are being constructed in connection with the municipal grain elevator. Bids are averaging $20,000 with no awards to date. The Northwest Steel Company of Portland is completing a new marine outfitting plant in which approximately thirty motors will be installed, aggregating 300 hp. More than $200,000,000 will be spent by the French government in Seattle, Tacoma, Portland and Vancouver, B. C., if the government approves of the contract for 174 ships recently awarded by the French government to the Foundation Company of Tacoma and Portland.

The expenditure of this sum in the Northwest ports means an even greater prosperity and activity in industrial lines than has heretofore prevailed. Ships ordered from the Foundation Company are to be of steel ranging from 2500 tons to 10,000 tons dead weight. The government is still in the local market for quantities of ship timbers for Eastern shipbuilders.

WIRE.—A decrease in price of rubber-covered wire is noted. This did not affect local dealers particularly, as a shortage of stocks has been experienced for some time. The demand for this commodity in all sizes is well sustained, owing to continued activity in shipbuilding and other building operations.

DOMESTIC APPLIANCES.—Since the holidays sales have decreased materially, especially in washing and sewing machines, percolators and flatirons.

SAN FRANCISCO

The present electrical attitude is one of watchful waiting. Orders are comparatively small and more in the nature of immediate needs than of stock, especially on standard material. There are many bids, however, from the government, mostly for small quantities of standard electrical wiring devices. The State of California and the Southern Pacific Railroad are also calling for bids on a lot of material. San Francisco and Los Angeles jobbers report that the prevailing epidemic of influenza has seriously hit their forces, especially in the sales departments. New building contemplated includes a hundred-thousand-dollar machine shop for Los Angeles, a large housing proposition in Clarkdale, Ariz., new schools and wharves for San Francisco, a projected 100-room tourists' hotel in Las Vegas, N. M.; a government radio station at Mare Island and a two-million-dollar religious temple in Paradise Valley near Phoenix, Ariz.

LAMPS.—Deliveries are fair, and considerable relief for customers whose stocks are low has been secured by carefully gleaning the stocks of other dealers who have plenty on hand.

WIRE AND CABLE.—Rubber-covered wire and cable has lately dropped to the 30-cent base and this has affected lamp cord as well. Jobbers are again selling standard sizes such as No. 14 single-braid in less than coil lots. There is very little business for waterproof wire and cable.

SCHEDULE MATERIAL.—Marine schedule material is in great demand, and several of the large manufacturers are supplementing their regular lines with emergency lines manufactured on the Pacific Coast by several firms. This business will continue unabated for many months. There has been a sharp drop in the price of standard sockets and push and snap switches of about 10 to 15 per cent.

CONDUIT.—Local stocks of conduit have been recovered, and once again it is possible to make coast shipments.

WASHING MACHINES.—The stock situation is better. The demand is not so good, however, as it was a few months ago.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	10%

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+30% to +20%
Coil to 1000 ft	List
	No. 12 Solid
Less than coil	+30% to +20%
Coil to 1000 ft	List

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00
Coil to 1000 ft	100.00
	No. 12 Solid
Less than coil	+30% to +20%
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to List
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 36%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
2 to 50	.40	.40— .41
50 to barrel	.35— .36	.36— .37
Barrel lots	.32— .329	.33— .339

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.44 to $0.45	$0.44 to $0.45
12 to 50	.38 to .39	.38 to .39
50 to barrel	.35 to .362	.35 to .372
Barrel lots	.326 to .332	.326 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
3/8	250	$5.00
1/2	250	7.50
3/4	100	10.00
1	50	13.00
1 1/4	50	21.00
1 1/2	50	26.00
2	25–50	35.00
2 1/2	25–50	45.00
3	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
3/8-in. single trip	$75.00	$63.75— 69.75
3/8-in. double strip	75.00— 82.50	72.00— 75.00
1/2-in. single strip	100.00	85.00— 93.00
1/2-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$63.25 to $63.75
3/8-in. double strip	78.25 to $78.75	71.25
1/2-in. single strip	100.00	75.00 to 85.00
1/2-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
1/2	$0.05½	1	$0.25
3/4	.06	1 1/4	.33
7/8	.09	1 1/2	.40
1	.12	1 3/4	.47
1 1/8	.15	2	.55
1 1/4	.18	2 1/2	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
1/2-in.—	$25.00–50.70	$24.60–35.20	$23.00–30.25
3/4-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
1/2-in.—	$60.00	$30.00	$26.00
3/4-in.—	65.00	32.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
1/4	$0.08½
3/8	.08½
1/2	.08½
3/4	.11½
1	.17
1 1/4	.23
1 1/2	.27½
2	.37½
2 1/2	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
1/4	$0.05	$0.19
3/8	.06	.19
1/2	.07	.19
3/4	.10	.25
1	.13	.37
1 1/4	.17	.45
1 1/2	.21	.50
2	.28	1.10
2 1/2	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb	7% to 7.1%	9% to 9.1%
2500 to 5000 lb	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 to 1/2 In.	3/4 to 3 In.
Less than 2500 lb	+5.5% to +3.5%	+3.5% to +1.5%
2500 to 5000 lb	+2.5% to +0.5%	+5% to +1.5%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.50 to $7.00
Discount	20% to 25%

CHICAGO

List price	$7.00 to $7.50
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $8.75
1/5 to std. pkg	5.50 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3¾-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4¾-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.47—$40.77
Coil to 1000 ft.	27.42— 32.98

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft.	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$33.00

CHICAGO

Net per 100	$30.00 to $33.00

OUTLET BOXES

	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%	10%
$10.00 to $50.00 list	30%	20%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	5%
1/5 to std. pkg.	15%
Std. pkg.	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$20.00 to $21.00
1/5 to std. pkg.	17.00 to 17.85

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00–$24.15
1/5 to std. pkg.	17.85– 21.00

Standard package, 2200. List per 1000, 20.00– 21.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 5½ N.C.—Solid Nail-it—N.C.
Less than 1/5 std. pkg.	$16.00	$32.00
1/5 to std. pkg.	13.60	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 5½ N.C.—Solid Nail-it—N.C.
Less than 1/5 std. pkg.	$13.00–$18.40	$32.00–$36.80
1/5 to std. pkg.	11.50– 16.00	27.20– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	List
1/5 std. pkg.	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	+10% to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	List to 8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+25%–+15%
$10 to $25 list	+10% to 2%
$25 to $50 list	+5 to 5%
	Low Grade
Less than $10 list	+15% to +5%
$10 to $25 list	2% to 8%
$25 to $50 list	5% to 15%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+30% to list
1/5 to std. pkg.	+5% to 10%
Std. pkg.	18%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 18%	Net
$2.00 to $10.00 list	10% to 28%	5%
$10.00 to $50.00 list	20% to 45%	10%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to $6.50
Discount	20% to 25%

CHICAGO

List price	$7.00
Discount	20% to 30%

WIRE, ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.55– $0.66
No. 18, full spools	.53– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.53 to $0.75
No. 18, full spools	435 to .635

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00–$25.00	$12.50–$17.00	$12.50–$15.00
12	23.40– 27.09	21.06– 23.22	17.55– 23.22
10	32.14– 32.40	28.92– 32.40	23.14– 27.45
8	40.32– 45.72	36.96– 45.72	32.26– 38.10
6	58.52– 72.36	53.20– 60.30	51.07– 57.88

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$24.00–$25.00	$17.50–$18.00	$15.00–$15.50
12	30.48– 31.44	30.48– 31.44	26.67– 31.44
10	42.32– 43.84	42.32– 43.84	37.03– 38.36
8	59.36– 61.76	59.36– 61.76	51.94– 54.04
6	97.68–101.28	85.47– 88.62	85.47– 88.62

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$38.75
25 to 50 lb.	38.75
50 to 100 lb.	37.75

CHICAGO

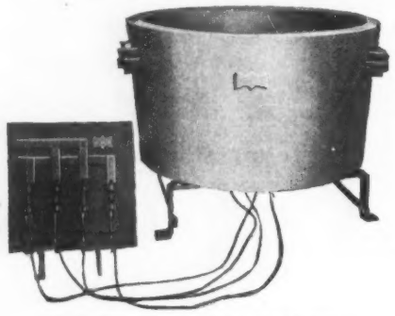
	Per 100 Lb. Net
Less than 25 lb	$35.76 to $39.75
25 to 50 lb.	34.76 to 38.75
50 to 100 lb	33.76 to 37.75

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Large Electric Melting Pot

A 30-gal. (113-l.) electric melting pot for industrial use in heating glue, wax, pitch and other materials is now being made by the Simplex Electric Heating Company of Cambridge, Mass. The pot, which is of cast iron, is surrounded by ample insulating material held in place by a galvanized-iron cas-



THREE HEATS ARE PROVIDED

ing, and has a diameter of about 28 in. (71 cm.) and a depth of 12 in. (30 cm.). The heating element is attached to the bottom of the pot and is designed so that a maximum temperature of not less than 350 deg. Fahr. (175 deg. C.) may be generated. Three heats may be obtained—a high heat requiring 7 kw., sufficient to bring the contents to the proper working temperature quickly; a medium heat taking 4.3 kw., and a low heat using 2.3 kw. Depending on the nature of the material being heated, either the medium or the low heat is used to maintain the proper temperature. Heat control is provided through the use of a switch panel having inclosed fuses.

Non-Water-Tight Receptacles for Marine Use

"Spartan" interchangeable-type receptacles and plugs for marine use where non-water-tight extension cord outlets are desired in cabins, staterooms and for other similar installations are being marketed by the Bryant Electric Company of Bridgeport, Conn. Especially advantageous, according to the maker, is the use of these plug-type receptacles since they fit the plugs furnished with every fan motor, practically all table lamps and many other appliances.

A composition material described as unbreakable is used for the bases of these receptacles as in all other Bryant marine devices, while the top section is composed of hard-white-glazed porcelain. A bottom diameter of $1\frac{3}{4}$ in. (4.45 cm.), a top diameter of $1\frac{3}{8}$ in. (3.49 cm.) and a height of $1\frac{13}{16}$ in. (4.6 cm.) are the dimensions of these receptacles, which have a groove of ample size in the bases for wires to pass through or to permit wire entrance from the bottom of the box.

One plug, the K. D. cap, is intended for use with small-size flexible cords not over $\frac{13}{32}$ in. (1.03 cm.) in diameter, while for heavily insulated or metal-armored cables up to $\frac{9}{16}$ in. (1.43 cm.) in diameter, the M. K. cap is best suited, as it is provided with a strain relief clamp and cord grip. As both these caps are made of unbreakable composition, they will withstand severe service.

Heavy-Type Ceiling Snap Switch

The Hart & Hegeman Manufacturing Company, Hartford, Conn., is now producing a heavy type of ceiling snap switch rated at 2-10 amp., 250 volts.

SUITABLE FOR MANY KINDS OF SERVICE

This switch can be furnished to give single-pole, double-pole, three-way, two-circuit and three-circuit connections. Nickel-finish covers are provided and 10 ft. (3 m.) of black cord is furnished with each switch.

Spray-Type Dishwasher of Large Capacity

The "Champion" electrically operated dishwasher for hotels and restaurants has a capacity of about 12,000 dishes per hour and is being manufactured by the Hamilton-Low Company, 145 East Forty-second Street, New York City. Dishes are fed into one end of the machine, travel on a belt conveyor, sprayed from above and below by washing and rinsing water, and come out cleaned at the other end.

A 2-hp. motor is directly connected to the driving shafts of two centrifugal pumps, which elevate the washing and the rinsing water to the sprays from two cast-iron tanks below the dish conveyor. The belt has power transmitted to its shaft by means of two sets of worm and gear. The machine is said to be easily operated since the water is renewed automatically, the operator's duties consisting of feeding and unloading the dishes.

No baskets are used for the dishes, these being placed directly on the conveyor, but mesh-wire baskets are used for washing the silverware. Removable doors inclose the entire mechanism, glass windows being provided in front so that the operation of the machine may be observed by the attendant. Beneath the conveying belt are placed perforated screens which catch all particles of food washed from the dishes. Another and finer screen is placed over the pump channel to prevent foodstuffs from being drawn into the pumps and sprayed back on the dishes. All moving parts of the machine are bronze or steel, according to particular requirements, and everything has been done, according to the makers, to insure durability and facilitate easy cleaning of the washer.

Light-Regulating Socket

The "Anylite" regulating lamp socket, by which it is possible to have twelve different intensities of light from the same bulb, has been placed on the market in an improved form by

UPPER END SCREWS IN SOCKET WHILE LAMP IS INSERTED IN LOWER END

the Anylite Electric Company of Fort Wayne, Ind. The regulator, which is inserted in a lamp socket, consists of an Edison screw-shell attachment plug, a resistor in series with the lamp terminals and a pull-chain regulator, and a medium-base brass shell socket

which is of the shade-holding type. The different parts are well insulated and ventilated, and the highly polished brass shell gives the device an ornamental appearance. The regulator is rated at 125 volts and 40 watts. Pulling one of the chains changes the light from 40 watts when the light is on full to 5 watts when most resistance is used. The other chain reverses the order, gradually changing the intensity from low to high.

Interior Fire-Alarm Apparatus

Fire-alarm mechanism arranged for operation in conjunction with the standard "Autocall" signaling system manufactured by the Autocall Company of Shelby, Ohio, or for separate use, is being marketed by this company. When used in connection with the Autocall system this fire-alarm apparatus saves the cost of separate signaling systems, since the fire-alarm calls are transmitted on the signaling instruments of the Autocall system, a device for summoning any one wanted, in whatever part of a building he may happen to be at the time. The fire-alarm equipment consists of fire boxes, which may be placed in the various rooms of a building, and a control board designed to automatically give the fire-alarm signals precedence over all other Autocall signals and so prevent the confusion which might occur were both systems operating at the same time.

The fire boxes are of the code-ringing type, installed in series on a closed circuit and connected to the signal circuit of the Autocall system through the dual control board. By breaking the glass in one of these boxes an alarm entirely different from the ordinary Autocall signals is transmitted on all the signaling bells, whistles or horns of the Autocall system. The alarm signals, which are given four times, consist of a preliminary or warning alarm of ten or more rapid taps followed by a code signal corresponding with the number of the fire box from which the alarm is turned in, this denoting the location of the fire. The boxes are designed to permit silent testing of the mechanism.

BREAKING GLASS AUTOMATICALLY OPERATES ALARM

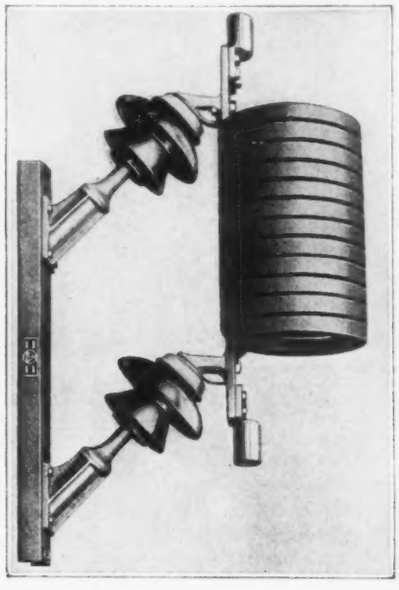
When a fire box is operated the control board instantly cuts out the Autocall central sending station, preventing ordinary calls from being turned in while the fire alarm is in the process of transmission. A time element on the board "holds out" the Autocall central-sending station until the fire signal has been repeated four times, when that station may complete an interrupted ordinary signal or transmit new calls. As a precaution against trouble the fire-box circuit is supervised by a small flow of supervising current. In case of a malicious or accidental interruption to any part of the fire-box circuit a trouble bell sounds a warning signal and continues ringing until the trouble is relieved. As the signaling instruments are constantly used by the Autocall system for ordinary signals they are under constant test and therefore do not require supervision. In this way, the maker states, the dependability of the fire-alarm service is assured.

Portable Radiant Heater

The "Cosy-Glow" electric heater being manufactured by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., may be used, it is said, to great advantage in homes, ticket booths and train cabs, for keeping frost from store windows and wherever electric heat is desired. A heavy cast-iron base insures firmness and yet allows the heater to be carried from place to place. The easily removable heating unit is wound on a porcelain cylinder and is placed perpendicular to the radiating surface. The reflector, which throws the heat in the same way as the searchlight reflects its rays of light, is made of polished copper and attractively finished. To clean the reflector the heavy copper wire guard which protects the heating unit can be removed. The heat rays may be turned in any direction since the reflector swings upward and downward as desired A handle for carrying and tilting purposes and a length of heater cord with a lamp socket plug complete the radiator.

High-Capacity Choke Coils for Outdoor Substations

For use with large-capacity outdoor steel-tower substations, the Delta-Star Electric Company, 2433 Fulton Street, Chicago, has developed a unit-type choke coil of high capacity. The choke coil proper is of long-turn cylinder form and of proportions to insure proper rigidity. The insulators are interchangeable and are so designed that flash-over occurs before puncture. To meet individual wiring requirements terminals for either flat or round conductors are supplied.



COIL IS LONG-TURN CYLINDER TYPE

Notes on Recent Appliances

Stoker for Small Plants

The Cokal stoker is being manufactured by the Cokal Stoker Company, 48 Division Street, Chicago, to meet the requirements of small boiler plants.

Motorless Electric Vibrator

For operation on alternating current a motorless electric massage vibrator with three applicators is being made by the Fitzgerald Manufacturing Company, Torrington, Conn.

Washing Machine with Twin Tilting Tubs

An electrically driven washer with two tubs which can be tilted to facilitate draining has been placed on the market by the Woodrow Manufacturing Company of Newton, Iowa.

Solderless Insulated-Wire Connector

An insulated-wire connector for use with fixture outlets and motor leads and which needs neither tape nor solder to install has been placed on the market by the Walger Connector Company, whose sales agent is C. Jackson, 22 College Street, Toronto, Canada.

Arc Welder for Alternating Current

Alternating current is taken from the line and transformed to a low voltage suitable for arc welding in the new welder being marketed by the Arcwell Corporation of 42 Broadway, New York City, thus eliminating a motor-generator. Different sizes of these outfits may be had ranging from a 75-amp. set for garage work to a 600-amp. type for heavy foundry work.

Trade Notes

Foreign Trade Opportunities

A firm in Italy (No. 27,909) wishes an exclusive agency among other things for electrical supplies and equipment. Terms thirty to ninety days' credit, or 2 per cent off for cash in thirty days. Correspondence in Italian.

Consul J. Paul Jameson includes in a short list of goods most needed in Tchita, Siberia, electrical apparatus and supplies of all kinds, including lamps, wire and motors, for 220 volts direct current.

L. K. Leon, 10 Tiberton Lane, off Killiney Road, Singapore, Straits Settlements, has written to the ELECTRICAL WORLD making inquiries regarding electric wiring supplies of American manufacturers. Communications should be direct and in English.

A man in Italy (No. 27,690) desires an agency for the sale of electrical machinery. Correspondence should be in French, Italian, Spanish or Portuguese.

A firm in Norway (No. 27,963) wishes an agency for electric stoves and electrical supplies. Correspondence may be in English.

An American (No. 27,948), with established connection in Mexico City, who is to leave for that country very soon, desires exclusive representation, among other things, for electrical supplies. Terms, cash against documents.

ITALIAN STATE LAMP MONOPOLY.—According to a report in the London *Electrical Review* from Milan, electric lamps have been declared a state monopoly in Italy.

BOSCH MAGNETO BUSINESS.—Plans are afoot for the organization of a corporation by the banking house of Hornblower & Weeks, Boston, to take over the business and assets of the Bosch Magneto Company, recently offered for sale by A. Mitchell Palmer, custodian of alien enemy property. The plant is at Springfield, Mass., and the company has been manufacturing magnetos and other motor accessories for years.

FEDERAL TRADE COMMISSION CITES ENGINE PACKING CONCERN.—Declaring that it has reason to believe the concern is engaged in the practice of giving to employees of its customers and prospective customers, as an inducement for them to influence the purchase of supplies, gratuities such as cash bonuses, commissions, cigars, meals, presents and entertainment, the Federal Trade Commission, "in the interest of the public," has issued formal complaint against the M. P. L. Packing & Supply Company, New York City. The concern, which sells packings and supplies for engines and engine rooms, was cited to appear before the commission in Washington on Jan. 29.

FEDERAL TRADE COMMISSION ISSUES ORDER IN SALE OF SPARK PLUGS.—The Federal Trade Commission has ordered the Silvex Company, Hellertown, Pa., maker of automobile spark plugs, to discontinue representations that its "Bethlehem Aviation" spark plug has been "certified by the United States Bureau of Standards." The commission found that while large numbers of Silvex plugs had been furnished the government and had been subjected to the usual Bureau of Standards tests, the "Bethlehem Aviation" plug had not been "certified" by the bureau, as represented in a circular letter sent out by the company. The commission's order was issued by agreement with the company, which waived right to introduce testimony in support of its act.

CRANE COMPANY'S CHRISTMAS GIFT FOR 1918.—For the eighteenth year since the Crane Company of Chicago adopted the plan of making cash Christmas gifts to its co-workers, the company last month distributed approximately $1,600,000, making a total for the eighteen years of $10,000,000. The basis of distribution for 1918—as for the last sixteen years—was 10 per cent of the year's earnings for each worker. About 13,000 co-workers shared in this distribution throughout the offices and works in Chicago and Bridgeport and the offices, warehouses and salesrooms in fifty-three cities of the United States and Canada. Crane men who had left the service of the company temporarily for that of the United States during the war shared in the cash distribution the same as if they had continued at work for the company. A Christmas greeting from the company accompanied each gift.

THE WESTINGHOUSE AUTOMOBILE EQUIPMENT DEPARTMENT MOVED TO NEWARK.—The Westinghouse plant at Newark, N. J., is now devoted to the making of electrical equipment for automobiles, this department of the company's works having been located previous to the war at Shadyside, Pittsburgh. The increasing demand for automobiles has given an added impetus to the manufacture of equipment. Besides a number of accessories, the plant is manufacturing lighting apparatus, an ignition system, a self-starting device and a generator and storage battery to supply power for these.

R. & M. MANAGERS MEET.—Managers of the Robbins & Myers branch offices and some of their assistants held their annual sales conference at the factory in Springfield, Ohio, on Dec. 16, 17 and 18 with the usual program of business addresses, discussions, individual conferences and entertainment features. The officials of the company pointed out that, while the last year has been a sellers' market in which demand from the factories for all commodities was in excess of supply, the resumption of normal business will mean the return to a buyers' market in which the producer and seller will meet competition. It was later pointed out by C. C. Miner, auditor, that while the outlook appears bright at the present time, caution must be exercised in the matter of credit. He stated that "in the immediate future we may look for business. Go after it and try to beat the other fellow, but don't let your desire for business prompt you to offer to consider anything other than the soundest of terms."

HYGRADE LAMP COMPANY EMPLOYEES FORM BENEFIT ASSOCIATION.—Employees of the Hygrade Lamp Company, Salem, Mass., have formed a mutual benefit organization to be known as the Hygrade Employees' Association, J. C. Carter being the first president. In case of sickness or disability the association will pay to any member who has been ill for a week, beginning with the eighth day of disability, $7.50 per week for each week of disability, not to exceed in all ten successive weeks in any twelve consecutive months. A death benefit of $250 will be paid to the registered beneficiary of any person insured under this plan while in the employ of the Hygrade company. The company is contributing a dollar for every dollar paid in by the members of the association and is represented on the executive committee by three members by vote of the association. At the end of the first week's enrollment 85 per cent of the company's employees were listed in the membership.

REVISED SPECIAL EXPORT LICENSE FOR SAMPLES.—The War Trade Board announces that W. T. B. R. 323, issued Nov. 23, 1918, and the Special License No. RAC-55, issued in accordance therewith, have been withdrawn, and that a revised special license, under the same number, (RAC-55), effective Dec. 24, 1918, has been issued. The revised special export license has been granted to the Post Office Department and to the customs service, authorizing the exportation, without individual export license, of samples of any commodity and advertising matter to be used therewith, regardless of whether the same are shipped by mail (subject, however, to the postal regulations), by freight or by express, in passengers' baggage or otherwise, when destined to any country. Under this license the term "samples" is construed to mean articles or portions thereof intended for use in soliciting orders and is not construed to include any article or portion thereof which is itself intended to be sold as an article of commerce.

NEW PROCESS GEAR CORPORATION CHANGES HANDS.—John N. Willys has purchased outright the New Process Gear Corporation of Syracuse, N. Y., taking over all of the $3,000,000 capital stock of the concern. There is no change contemplated in the nature of the product the company will manufacture, although it is naturally expected that material expansions in the old field will result. It is the intention of the company to solicit gear business of all kinds, and particularly in so far as the manufacture of gears relates to differentials and transmissions for the automobile trade. Thomas W. Meachem and other members of the Meachem family connected with the corporation have retired, having sold their interests to Mr. Willys. On the latter's part this step represents complete acquisition of a plant in which he previously had been partially interested. No change of active management has been intimated, immediate control of the enterprise being in the hands of J. Allan Smith. The new officers of the company are: J. N. Willys, chairman; J. Allan Smith, president; J. E. Kepperley, vice-president; C. A. Neracher, vice-president; E. J. Quintal, treasurer and assistant secretary.

ARTICLES STILL SUBJECT TO MEXICAN TARIFF.—By the degree of Aug. 27, 1918, machinery of all kinds unless otherwise specified, as well as separate parts, will be admitted free of charge into Mexico. Subsequently, however, by the circular of Oct. 21, 1918, the Director General of Customs of Mexico directed that exceptions be made in the case of certain articles which will continue to stay at the old rate of 45 cents per 100 lb. gross weight. Included in the articles still subject for duty, as transmitted by Vice-Consul Joseph W. Rowe of Mexico City, are telephones and telephone apparatus of all kinds, elevators, motor cars for railway use, electric batteries, carbon and zinc cylinders for electric batteries, lightning rods, clamps for electric batteries, circuit breakers for electric arc lamps, porcelain or glass battery cells, zinc in rods or cyclinders or plates for electric batteries.

WESTINGHOUSE MARINE WORKS WILL EXPAND TO FOUR TIMES PRESENT CAPACITY.—Officials of the Westinghouse Electric & Manufacturing Company's Works at Essington, Pa., have answered the question regarding their peace policy by immediately beginning the expansion of their works to four times the present capacity. Not only will they retain in their employ their operating force of 3500 skilled mechanics and laborers, but they definitely plan to increase their force to 5000 men at once, and later to 12,000. Contracts are now held for 250 ships for the Emergency Fleet Corporation, to be equipped with the Westinghouse marine system of propulsion machinery, besides other contracts with the United States government for destroyers, cruisers and other naval units. Whether the present policy of a bigger navy stands or not, the enormous demand for merchant ships will now force the completion of the plans originally made by the company for execution at South Philadelphia. Contracts with the government for marine equipment are expected to stand, and the broad policy of this country to develop a great merchant marine is beginning to assume definite proportions, so that business is practically assured for the Essington plant for some time to come; but even though these prospects should not materialize, the Westinghouse company needs the new developments for the expansion of its general electrical business. The parent works at East Pittsburgh have completely covered all of the available space, and Essington will have to take over some departments of the industry. The company is now carrying out its specifications for a town site for its employees. The program calls for 1400 cottages. Sixteen are already completed and occupied.

THE WAR TRADE BOARD announces that electric lamps have been removed from lists of restricted imports.

THE WAR TRADE BOARD has removed from the export conservation list, effective Jan. 4, mica and mica splitting.

DWIGHT P. ROBINSON & COMPANY, INC., constructing and consulting engineers, announce the opening of their offices at 61 Broadway, New York City.

THE WELLMAN-SEAVER-MORGAN COMPANY of Cleveland, Ohio, has opened a San Francisco office at 415-417 Rialto Building, in charge of Norman S. Ross. Business originating from California, Nevada west of the 115th meridian, Lower California and the counties of Josephine, Jackson and Klamath in Oregon is in this territory.

HORACE N. TRUMBULL, who has recently received his discharge from the Engineers Officers' Training School at Camp A. A. Humphreys, Va., has been appointed advertising manager of the Wellman-Seaver-Morgan Company. Before entering the service, Mr. Trumbull was advertising manager of the SKF Ball Bearing Company of Hartford, Conn.

LANDERS, FRARY & CLARK'S Danbury (Conn.) plant, which has been devoted to the manufacture of electric ranges, is being moved to New Britain, Conn., where it will be operated in connection with the main factory of the company. The Danbury factory was formerly owned by the National Electric Utilities Company of New York City.

THE AMERICAN CONDUIT MANUFACTURING COMPANY, New Kensington, Pa., has appointed R. S. Wakefield, 1312 Great Southern Life Building, Dallas, Tex., as its Southern rigid-conduit agent.

J. L. FINNICUM, formerly connected with the Doubleday Hill Electric Company of Pittsburgh as manager of the industrial and power department, is now district manager of the Chicago district for the Electrical Products Company of Cleveland, Ohio, with offices at 1064 People's Gas Building, Chicago.

THE ELECTRICAL MANUFACTURING COMPANY and the Safety Meter Box Company have moved from their former quarters at 112 Hamilton Avenue to 4149 East Seventy-ninth Street, Cleveland, Ohio. In their new quarters these concerns will have 200 per cent more floor space and will install improved machinery to increase production 200 per cent.

WALTER N. POLAKOV, consulting engineer, announces the founding of Walter N. Polakov & Company, Inc., consultants in power production methods, industrial investigations, labor problems, scientific record systems and production accounting, with offices at 31 Nassau St., New York City. With the close of hostilities a number of capable engineers formerly associated with him have joined the staff of the corporation.

THE SANFORD RILEY STOKER COMPANY, Worcester, Mass., and the Murphy Iron Works, Detroit, Mich., have announced that W. L. Bigelow will take the position of Eastern sales manager directing the sales and services of both the Riley Underfeed Stoker and the Murphy automatic furnace, with offices at 1226 Woolworth Building, New York City. Mr. Bigelow's duties began on Jan. 1. For the past nine years he has been district manager for the Murphy Iron Works at Pittsburgh, Pa.

THE FIRST NATIONAL BANK OF BOSTON is sending two of its senior officers to Australia and the Far East to establish further foreign banking conections. C. F. Weed, vice-president of the bank, and D. A. de Benocal, vice-president of the First National Corporation, will leave Boston about Jan. 20, sailing from San Francisco directly to Australia. After a few weeks in Australia, to be spent principally in Sydney and Melbourne, they will go to China and then return by the way of Japan.

E. ERICHSEN, formerly of New York, manager of the Allied Machinery Company of America, has now joined the Youroveta Home & Foreign Trade Company, Inc., 165 Broadway, New York, as vice-president and manager of the New York office. Mr. Erichsen was born in 1882 in Bergen, Norway. He was educated at the Bergen Technical College and at the Charlottenburg University in Berlin. He has had extensive engineering experience in America and Norway, and from 1909 to 1914 he was managing director of important stamping and enameling works in Bergen.

THE ELECTRIC MACHINERY COMPANY, Minneapolis, Minn., announces a new line of 60-cycle, 600 to 800-r.p.m., two-phase and three-phase induction motors, ranging in size from 20 hp. to 500 hp., with both squirrel-cage and wound-rotor windings in 220, 440, 550 and 2200 volts. Ball and roller bearings exclusively, closed frame, free-air ventilation and open-slot starter construction are claimed by the manufacturers as features. For a number of years the company has been planning to bring out a line of induction motors designed to supplement the field of E-M synchronous motors.

DICK, KERR & COMPANY, LTD., of London, at its annual meeting, Nov. 14, gave out a statement that an alliance has been made with Siemens Brothers & Company, Ltd., by which much economy can be effected through the amalgamation of selling organizations and coördination of designs and products. There is no competition in manufacture as Siemens Brothers & Company made cables, dynamo machinery, telephones, etc., while Dick, Kerr & Company have specialized in apparatus for railways and tramways, steam turbines and the larger classes of electrical machinery. It has also been decided to establish companies in France and in Japan to exploit manufacturing rights in connection with apparatus for railways and tramways. In the belief of the chairman there would be a large after-war demand for all classes of electrical machinery, especially large-sized steam turbines, and he assured the shareholders that the company's facilities for taking care of this demand would be ample.

Trade Publications

GRAPHIC POWER-FACTOR INSTRUMENTS.—The Esterline Company, Indianapolis, Ind., has issued bulletin No. 388 describing its new line of graphic recording power-factor instruments.

KITCHEN MACHINES.—General descriptions of its three-speed mixers for hotel, restaurant and other large kitchens are given in a recently prepared booklet of the Read Machinery Company of York, Pa.

WASHING MACHINE. — The Henrici clothes washer for use in hospitals, commercial laundries and hotels, and marketed by the Troy Laundry Machinery Company, Ltd., of Troy, N. Y., is the subject of a booklet distributed by this company.

PEELING MACHINE.—Electrically operated vegetable-peeling machines which use an abradant and water to produce indirect friction are described in a circular of the Hamlin Peeling Machine Company, 430 Eleventh Avenue, New York City.

LIGHTING FIXTURE. — Standard and period styles of the "Four-in-One" light, which is dust-proof and "bug-proof" are listed and illustrated in a recently issued catalogue of the Black & Boyd Manufacturing Company, 17 East Forty-seventh Street, New York City.

MIXING AND BEATING MACHINES. —Harvey Brett, 141 West Thirty-sixth Street, New York City, has issued a twelve-page folder which contains descriptions and illustrations of the "Reliance Mixobeater" machines for use in the kitchens of hotels, restaurants, etc.

SILVER-BURNISHING MACHINE.—H. G. W. Young, 61 Hanover Street, Boston, who distributes the "Imperial" silver burnisher for flat and hollow silver ware, has printed a booklet containing illustrations and general descriptions of these motor-driven machines for jewelers, hotels and restaurants.

DISHWASHING MACHINES. — Dishwashers which use belt or gear connected electric motors not only to operate the washing mechanism but to raise and lower the baskets of dishes as well are shown and described in a recently distributed booklet of the Insinger Company, Wayne Junction, Philadelphia.

X-RAY TABLES.—Bulletin No. 25, prepared by the Kelley-Koett Manufacturing Company of Covington, Ky., illustrates a line of portable and base-hospital X-ray tables, such as are being used in France and in army cantonments. The magnetic filament regulator for Coolidge tubes which is also a product of this company is the subject of a blotter recently issued.

STORAGE BATTERIES.—"The Theory of the Storage Battery," technical bulletin No. 28, issued by the General Lead Batteries Company of Newark, N. J., contains sixteen-pages of useful information on recent developments in storage-battery construction and operation. Practically no advertising matter is contained in this publication, which devotes itself to a simple exposition of the principles of the storage battery.

LIGHTING FIXTURES.—"The Unit of Day Brightness" is the title of a twelve-page catalog, No. D-5, just published by the Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago. In it are set forth the general advantages of the "Denzar" glareless, shadowless and dustproof lighting unit as well as the individual features of different pendent and ceiling types which are illustrated, described and priced.

MINE DUTY SELF-STARTERS.—The sliding-control and the magnetic-switch type of mine-duty self-starters, which are especially adapted for automatic control of motor-driven pumps in damp locations and which are made by the Cutler-Hammer Manufacturing Company of Milwaukee, have been made the subject of publication No. 408 from that company. Space in this bulletin is also devoted to unit-charging racks for miners' electric lamps in which a battery can be readily placed.

COAL-HANDLING APPARATUS. — A recent publication of the Link-Belt Company of Chicago is its book No. 333, the eighty-eight pages of which are devoted to the subject of equipment for handling and preparing coal at mines. Illustrations not only of the Link-Belt apparatus itself but of various installations form a considerable part of the book, which also describes the construction, uses and operation of various coal carriers, loaders, hoists, crushers and other coal-mining equipment.

SILVER BURNISHER.—In "The Silver Service—Its Care," a folder printed by the American Laundry Machinery Company, 134 West Thirty-seventh Street, New York City, two models of the "Tahara" automatic silver burnisher for hotels and restaurants are shown and described.

STORAGE BATTERIES.—The Atlas Electric Storage Battery Company of Greenville, Mich., has prepared and issued its thirty-two-page bulletin No. 2. As explained in the preface, the purpose of the booklet is not only to tell the amateur or layman what a storage battery is and how it is constructed, but to give him information for selecting the proper battery for lighting and ignition on his automobile. Accordingly all makes and models of automobiles are listed, together with the proper "Atlas" battery for use with each.

AUTOMOBILE STORAGE BATTERIES. —The Perfection Storage Battery Company, Rhodes Avenue and Fortieth Street, Chicago, has recently issued catalog No. 17, a sixteen-page publication on storage batteries for automatic starting, lighting and ignition. Besides general descriptions of these batteries and directions for their operation and upkeep, all makes and models of American cars are listed together with the proper "Perfection" battery for use with them. Other tables of battery information are also included in this catalog.

WIRES AND CABLES.—The Eugene F. Phillips Electrical Works, Ltd., of Montreal, Canada, have recently published a 270-page handbook entitled "Phillips' Wires and Cables." The book, which is pocket-size and handsomely bound in leather, is printed on coated paper, is illustrated and comprises five sections. The subjects of these are electrical conductors, bare and weatherproof wires and cables, magnet wires and cotton-covered wires, rubber-insulated wires and cables and flexible cords, paper-insulated power cables and telephone cables and varnished-cambric insulated cables, and general information. Aside from the complete information furnished about the company's many different varieties of wires and cables, tables of wire weights and diameters and other very useful information to the wire user are given.

New Incorporations

THE CARLOCK (ILL.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $15,000 by W. L. Carlock, J. K. Esh, J. E. O'Hara and S. E. Maurer.

THE ADVANCE ELECTRIC COMPANY of St. Louis, Mo., has been incorporated with a capital stock of $50,000 by Edward Bretch, A. L. Canavan and D. J. O'Keefe. The company will make electrical machinery.

THE KANT BREAK SPARK PLUG COMPANY of St. Louis, Mo., has been incorporated with a capital stock of $30,000 to manufacture and deal in electrical supplies. The incorporators are J. M. McKernan, D. M. Hutchinson, John White and others.

THE ELECTRIC SCALING COMPANY of New York, N. Y., has been chartered with a capital stock of $100,000 by O. C. Olsen, G. Sunseth and P. Baumer, 1 Broadway, New York City. The company proposes to operate a ship repair and scale cleaning plant.

THE FLETCHER ELECTRIC COMPANY of New York, N. Y., has been incorporated by J. C. Mills, J. M. Lyon and D. C. Keefe, 660 East Twenty-third Street, New York City. The company is capitalized at $24,000, and proposes to manufacture electrical specialties.

THE CHIPPEWA POWER COMPANY of Eau Claire, Wis., has been incorporated with a capital stock of $200,000 by P. D. Kline, Donald Boyd and V. S. Hillyer. The company proposes to develop a power site on the Eau Claire River and construct a hydroelectric power plant north of Eau Claire.

THE WARD ENGINEERING & BATTERY COMPANY of Miami, Fla., has been incorporated with a capital stock of $30,000 to carry on a storage-battery supply and repair business. The officers are: R. E. Ward, president; R. M. Moffatt, vice-president, and R. G. Ward, secretary and treasurer.

New England States

NEWMARKET, N. H.—The Newmarket Electric Company and the Rockingham County Light & Power Company have filed a joint petition with the Public Service Commission whereby the Newmarket company asks permission to sell and transfer its property to the Rockingham County company. The latter company also asks for authority to supply electricity in the towns of Newmarket, Newfields, Epping and Durham.

BRATTLEBORO, VT.—The Brattleboro Retreat has entered into a contract with the Connecticut River Power Company to furnish electricity for lamps and motors for the retreat. Under the terms of the contract the Connecticut company secures the right to flow the meadows to a higher point than before.

RUTLAND, VT.—The Rutland Railway, Light & Power Company has been awarded contract by the Rutland Railroad Company for additional energy. The company has also been awarded contracts by the American Fork & Hoe Company and the Wallingford Manufacturing Company for supplying increased electrical service.

BOSTON, MASS.—Plans are under consideration by the Trustee Electric Garage, care of A. F. Bowditch, engineer, 44 Bromfield Street, Boston, for the construction of a garage at 57-93 West Dedham Street, to cost about $175,000.

LOWELL, MASS.—The Lowell Electric Light Corporation has petitioned the Gas and Electric Light Commissioners for permission to issue 2941 shares of capital stock at $125 per share, the proceeds to be used to meet the cost of improvements to its plant.

WESTBORO, MASS.—Steps have been taken by the Board of Trade to secure action relative to improving the street-lighting system.

WEYMOUTH, MASS.—The Massachusetts Highway Service Company, known as the "trackless trolley company," has petitioned the Selectmen for permission to erect and maintain poles and wires for the purpose of operating a motor trackless trolley system upon certain streets of the town.

WORCESTER, MASS.—The directors of the Worcester Electric Light Company have voted to petition the Gas and Electric Light Commission for permission to issue 4000 shares of capital stock at $185 per share, increasing the capital stock from $1,600,000 to $2,000,000.

WARREN, R. I.—The Warren Manufacturing Company is installing additional electric generating equipment in its power plant.

BRIDGEPORT, CONN.—The lamp committee in its annual requisition to the city auditor asks for $9,081 for new work in a total budget of $117,314. The proposed new work includes the installation of sixty-nine new ornamental lamps, forty-seven arc lamps and thirty tungsten lamps.

HARTFORD, CONN.—The Jewell Belting Company, 55 Trumbull Street, Hartford, is contemplating the construction of a factory in Parkville, to cost about $100,000. H. Wolcott of Elmwood is engineer.

WINDSOR, CONN.—With a view of developing its water-power privileges at Rainbow, the Farmington River Power Company, controlled by the Stanley Works of New Britain, has purchased the mill and other property in Windsor, including the Rainbow Paper Company's plant, known as the Vernon mills, the Hartford Paper Company's so-called No. 2 mill and land and water rights on both sides of the Farmington River to the present plant of the Farmington company at Oil City. Ultimately it is planned to develop the power for transmission to New Britain over a high-tension line 25 miles in length. The Stanley Works are at present supplied with electricity from a water-power plant on the Farmington River operated by the Farmington River Power Company.

Middle Atlantic States

ALBANY, N. Y.—Three shop buildings at the foundry department of the plant of Rathborne, Sard & Company, North Albany, were destroyed by fire recently, causing a loss of about $75,000. The company manufactures electrical specialties, ranges, stoves, etc.

BROOKLYN, N. Y.—Notice has been filed by A. Arnesen, Inc., 312 Court Street, of an increase in capital stock from $10,000 to $50,000. The company operates an electrical business.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

GENEVA, N. Y.—The contract for electrical work in connection with alterations to be made at the County Hospital at Geneva has been awarded to Bennet & Phillips of Holcomb.

NEW YORK, N. Y.—The Spilger Electric Company, 78 Warren Street, has been awarded contract for electric wiring, etc., in connection with the new Young Men's Christian Association building, now under construction, at 181st Street and University Avenue.

NEW YORK, N. Y.—The E. J. Electric Installation Company, 221 West Thirty-third Street, has been awarded a contract by the United States government for electrical work in connection with various improvements and alterations being made at the Brooklyn Navy Yard, at $4,668.

NEW YORK, N. Y.—Plans are being prepared by F. G. Frost, architect, 19 West Forty-fourth Street, for the erection of a garage, warehouse and storage plant to be erected on a site between Thirty-sixth and Thirty-seventh Streets and Second and Third Avenues, for B. Altman & Company, to cost about $250,000.

NEW YORK, N. Y.—Arrangements have been completed by the board of trustees of Bellevue and Allied Hospitals for the proposed alterations and improvements in the power house at the hospital building at Lenox Avenue and 136th St., which will include the installation of new ash-handling and other equipment. L. Gottlieb, 225 East 138th Street, is contractor.

SAYVILLE, N. Y.—Contract has been awarded by the United States government to the Hennebique Construction Company, 1170 Broadway, New York City, for the erection of a transformer building at the local station.

CAMDEN, N. J.—Arrangements have been made by the city officials for appropriations of $13,500 and $105,000 in the annual budget to be used for the operation of the city electrical bureau and municipal lighting purposes repectively.

JERSEY CITY, N. J.—The lowest bid for the installation of the proposed new electric lighting system on the Boulevard, commencing at the Morris Canal and extending to Manhattan Avenue, was submitted by Walter J. Coleman, 29 Willow Court, at $9,400. The commission, it is said, has under consideration the installation of new lamps of larger candlepower in various sections of the Boulevard in the near future.

WEST NEW YORK, N. J.—Plans have been completed by the Hudson County Board of Freeholders for the construction of a power house heating and lighting plant at the county institution at Laurel Hill. The building will be about 100 ft. by 185 ft. O. S. Auf 'der Heide, Court House, Jersey City, is chairman.

HARRISBURG, PA.—Plans are under consideration by the city officials for improvements to the electric street-lighting system in various sections of the city. It is proposed to erect new lamp standards, new arc-lighting units and make other improvements in the system in the Fourteenth Ward.

HONESDALE, PA.—The electric plant of the Honesdale Consolidated Heat, Light & Power Company was recently destroyed by fire, causing a loss of about $50,000.

LANCASTER, PA.—Plans are under consideration by the Conesoga Traction Company for the construction of a branch electric railway to Marietta and Maytown to provide transportation for the works at the proposed new railroad shops to be erected at Marietta by the Pennsylvania Railroad Company. Work, it is understood, has begun on preliminary surveys.

PHIALDELPHIA, PA.—Notice has been filed by the Electric Furnace Construction Company, Finance Building, of an increase in capital stock from $100,000 to $300,000, to provide for expansion.

PHILADELPHIA, PA.—Plans are being prepared by the Navy Department, Washington, D. C., for the construction of a new power plant at the League Island Navy Yard, to cost about $35,000.

PHILADELPHIA, PA.—Plans have been prepared for the erection of a one-story shop building and office building at 926 North Third Street by George Sachsenmaier & Company, 145 North Third Street. The company manufactures dynamos, etc.

BALTIMORE, MD.—The Magneto & Machine Company, 1031 Cathedral Street, is planning to construct a machine shop, 22 ft. by 55 ft.

ST. HELENA, MD.—Arrangements have been completed by the Dundalk Company for the erection of three new buildings at the local pumping station. The cost of the entire work is estimated at about $25,000.

SPARROWS POINT, MD.—In connection with new construction work now under way at the local steel works of the Bethlehem Steel Company, which include a new plate mill, coke ovens and by-products recovery plants, considerable electric equipment will be required, including electrically operated derricks, cranes and railways in the ore pier of the company and for other departments.

MARTINSBURG, W. VA.—The new water-power development of the Hagerstown & Frederick Railway Company at Dam No. 5, on the Potomac River, is nearly completed. The new plant and dam cost between $400,000 and $500,000 and will develop about 1500 hp.

ALEXANDRIA, VA.—A movement has been started by the retail merchants' bureau of the Chamber of Commerce to secure improvements to the street-lighting system.

STAUNTON, VA.—Arrangements have been completed by the Staunton Community Association to install an electric lighting system in Staunton.

WASHINGTON, D. C.—Plans are under consideration by the Ordnance Department, Washington, D. C., for the erection of a new electrical shop at the local ordnance works.

WASHINGTON, D. C.—Contract has been awarded by the Washington Railway & Electric Company for the construction of an electric substation, to cost about $3,000, to Lake Stone of Washington.

WASHINGTON, D. C.—Bids will be received in the near future by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at Brooklyn, N. Y., under Schedule 7657½—8000 ft. of interior cable; Schedule 7659½—wave changers, loading coils and inductance system. Application for proposal blanks should give the schedule desired by number.

North Central States

ANN ARBOR, MICH.—The Detroit Edison Company has submitted a proposition to the City Council offering to install an entire new street-lighting system for the city.

LANSING, MICH.—Valuable water rights, including farms, along the Grand River in the vicinity of Portland are among the assets of the Michigan Power Company which are to be sold at auction by the receiver at Lansing on Jan. 18.

AKRON, OHIO.—The Biggs Boiler Works Company is considering an extension to its plant, which, if carried out, will require a 15-ton electric traveling crane and a hydraulic riveting machine.

WARREN, OHIO.—The Taylor Welder Company of Warren is planning to extend its activities in the electric welding equipment field. The company is bringing out an electric welding outfit using alternating current.

YOUNGSTOWN, OHIO.—The installation of between fifty and sixty new street lamps in various parts of the city will be recommended to the City Council by the lighting committee.

YOUNGSTOWN, OHIO.—Plans have been prepared by the Youngstown Steel Car Company for the construction of a new plant, involving an expenditure of about $2,000,000. The company has acquired a site near the plant of the Standard Boiler Company. William Wilkoff is president.

DECOURSEY, KY.—Contract has been awarded by the Louisville & Nashville Railroad Company to Romwell Brothers of Louisville for erection of a roundhouse in Decoursey, to cost about $150,000.

WHITCO, KY.—The Whitesburg Coal Company would like to receive prices on a complete power plant of 150 kw. capacity, 250 volts direct current. J. Henry Hall of Whitco is manager.

CHICAGO, ILL.—Plans have been prepared by Henshein & McLaren, engineers, 1600 Colony Building, for the erection of a building at 925 West Thirty-seventh Street for the Illinois Packing Company, to cost about $125,000.

CHICAGO, ILL.—Bunte Brothers, 739 West Monroe Street, are contemplating the erection of a candy factory on Franklin and Ohio Streets, to cost about $1,500,000.

CHICAGO, ILL.—Application has been made to the Illinois Public Utilities Commission by the Commonwealth Edison Company for authority to issue $4,000,000 in bonds to finance extensions during the coming year. Samuel Insull is president of the company.

QUINCY, ILL.—The question of establishing a municipal electric light plant in Quincy is under consideration by the City Council.

JANESVILLE, WIS.—Work will soon begin on the construction of the second unit of the new farm-tractor manufacturing plant of the General Motors Corporation in Janesville. The building will be 200 ft. by 500 ft. and will be used for foundry. Contracts, it is expected, will be awarded to the same companies erecting the first unit, which is nearly completed.

SUPERIOR, WIS.—Preparations are being made by the City Council to purchase the lighting plant of the Superior Water, Light & Power Company under the authority conferred through a recent election authorizing the purchase of the plant, to be owned and operated by the municipality.

MINNEAPOLIS, MINN.—The Dispatch Motor Car Company, Fourteenth Avenue, is considering extensions to its automobile plant to cost about $100,000.

WELLS, MINN.—The municipal electric light plant and water facilities were put out of commission recently by the collapse of the city water tower, which crushed the light and power plant.

SIOUX CITY, IOWA.—The Western Terminal Elevator Company, recently incorporated, is contemplating the construction of a 1,000,000-bushel elevator, to cost about $650,000. M. King, Davidson Building, is president.

CONCORDIA, MO.—Plans, it is reported, have been prepared by Charles F. May, Merchants' Laclede Building, St. Louis, for the installation of a power plant at St. Paul's College.

KANSAS CITY, MO.—The Kansas City Light & Power Company has purchased a site at Thirty-first and Cherry Streets on which it proposes to erect a substation.

ST. LOUIS, MO.—The Union Electric Light & Power ompany, 315 North Twelfth Street, is contemplating the construction of a boiler house, to cost about $15,000.

ST. LOUIS, MO.—Contract, it is reported, will soon be awarded by the Warren Steel Casting Company for the construction of a new machine shop. Electric motors and other equipment will be required.

ST. LOUIS, MO.—Plans have been prepared by the General Motors Corporation of Detroit, Mich., for the erection of a three-story factory and heating plant on Natural Bridge Road and Union Street, to cost about $1,000,000. Standish Backus, Boyer Campbell Building, Detroit, Mich., is secretary.

BERESFORD, S. D.—Application has been made to the City Council by a local business man for a franchise to install an electric light plant.

BURKE, S. D.—Bonds have been authorized for the installation of a municipal electric light plant in Burke.

OMAHA, NEB.—Plans are being prepared by J. H. Craddock & Company, architects, Farnum Building, for the construction of a cold-storage building for the Higgins Packing Company. The plans in progress are for a three-story and basement building, 100 ft. by 50 ft., with final size four stories and basement, 100 ft. by 270 ft. The total cost of the structure is placed at $600,000.

Southern States

ANDERSON, S. C.—Arrangements are being made by the Anderson Cold Storage Company for the installation of a 35-ton ice plant and cold storage facilities for which electric power will be used. Machinery, it is understood, has been purchased.

CHARLESTON, S. C.—The Navy Department, Washington, D. C., is considering the following construction work at the Charleston Navy Yard: An oxyacetylene plant, to cost about $25,000; fuse house, $3,000; refrigerating plant, $100,000; fire protection work, $50,000; service building, $30,000, and garage, $25,000.

ATLANTA, GA.—The electric light and telephone committee has recommended to the finance committee that the report submitted by R. C. Turner, city electrician, recommending that $70,000 be included in next year's budget for the construction of an electric plant for the purpose of utilizing the steam which is going to waste at the city crematory, be adopted.

SAVANNAH, GA.—The Forest City Ice Cream Company, 241 Whitaker Street, is planning to erect a plant, to cost about $100,000. B. J. Ford is manager.

MEMPHIS, TENN.—Bids will be received at the office of the Mississippi River Commission, First and Second Districts, Custom House, until Feb. 4 for furnishing turbines, pump set, feed-water heater, boiler and electric light plant for hydraulic grader No. 1820. For details see Searchlight section.

NATCHEZ, MISS. — The City Council has engaged an engineer to prepare an estimate of the cost of establishing a municipal electric light plant in Natchez.

ARANSAS PASS, TEX.—Arrangements are being made by the France & Canada Oil Transport Company of New York, N. Y., for the construction of facilities for building concrete fuel barges on Harbor Island, to cost about $1,000,000. The work now under construction includes special wharf 1100 ft. long, three standard 55,000-barrel concrete fuel-oil storage tanks, machine shop, woodworking shop, toolhouse, stock room, drafting plant and electric light plant. Contract for barge building has been awarded to the MacDonald Engineering Company, 53 West Jackson Boulevard, Chicago, Ill.

McALLEN, TEX.—The Rio Grande Public Service Corporation is reported to be considering extensions and improvements to its local electric plant, waterworks system and ice plant. New machinery to double the output of both plants, it is understood, will be installed. R. F. McCord is general manager.

PALACIOS, TEX.—The city has voted to purchase the local electric light plant and to operate the lighting system in connection with the waterworks.

Pacific and Mountain States

OAKVILLE, WASH.—Frank Leisner, owner of the local electric light plant, it is reported, will dismantle and remove the equipment of the plant.

CALEXICO, CAL.—Investigations are being made by the City Trustees relative to the installation of a municipal electric light plant in Calexico. Electricity is now supplied by the Southern Sierras Power Company of Denver, Col., over a transmission line 500 miles long.

FRESNO, CAL.—The San Joaquin Light & Power Company has begun work on extensions to its system in Madera County involving an expenditure of from $45,000 to $50,000, which will include the erection of a new substation 5 miles west of Chowchilla on the Robertson Boulevard to supply the district south and west of Chowchilla, and the erection of a 60,000-volt transmission line 9½ miles long.

HANFORD, CAL.—The State Railroad Commission has authorized the Mount Whitney Power & Electric Company to issue $200,000 in capital stock to purchase the stock of the H. G. Lacey Company, which furnishes light, heat and power in Hanford.

HOLLISTER, CAL.—The Coast Valley Gas & Electric Company is planning to extend its electric transmission lines from King City to the New Idria mines in the near future. The cost of the proposed line is estimated at about $85,000.

IMPERIAL, CAL.—The Holton Power Company is planning to rebuild its local substation, recently destroyed by fire.

LOS ANGELES, CAL.—Plans are being prepared by A. C. Martin, architect, Higgins Building, for the erection of a steel plant on Santa Fé Avenue, to include machine shop, foundry, warehouses, etc. The cost is estimated at about $100,000.

LOS ANGELES, CAL.—In a special report submitted to the Public Service Commission by E. F. Scattergood, chief electrical engineer, he recommends that the city offer to purchase the distributing lines of the Southern California Edison Company now serving Municipal Pier No. 8, Smiths Island, and the fish harbor in the harbor district. Some time ago the Harbor Commission notified the Edison company to remove its wires from the municipal poles serving the harbor district. The company maintains that it does not have to remove its wires and that the city's extensions have been in violation of the operating agreement between the city and the company. In order to settle the controversy it is proposed to purchase the distributing lines of the company.

SACRAMENTO, CAL.—Contract has been awarded by the Northern California Milk Producers' Association to the Clinton Construction Company of San Francisco for the construction of a new plant, which will include a cold-storage plant, power house and a 30,000-gal. fuel oil tank. The cost of the plant is estimated at about $125,000. Henry M. Ellis is manager.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company is contemplating rebuilding its distributing systems at both Bryon and Brentwood, with an independent substation at each place, on a 110-220-volt circuit. The plans provide for a lighting district in each town if the property owners so decide. C. S. Northcutt of Modesto is district manager.

SAN FRANCISCO, CAL.—Application has been filed by Dudley Moulton of San Francisco with the State Water Commission for water rights on the Pitt River in Shasta County, one estimated to cost $1,250,000, and the other $1,500,000. The first application asks for 2000 cu.ft. per second. A dam will be built 185 ft. high, 600 ft long at the top and 80 ft. long at the bottom. The second is for water from the same river, which contemplates the construction of a dam 150 ft. high, 800 ft. long at the top and 100 ft. long at the bottom. It is planned to carry 5000 ft. per second.

OGDEN, UTAH.—The City Council is considering the question of establishing a municipal electric light plant.

CHANDLER, ARIZ.—Permission has been granted to the Chandler Water & Light Company by the Arizona Corporation Commission to issue $5,000 in bonds for improvements to its system.

HOLBROOK, ARIZ.—W. H. Clark of Los Angeles, Cal., it is reported, is head of a group of capitalists who contemplate a power project in a large lignite coal field about 72 miles southwest of Holbrook and the erection of transmission lines to Globe and Miami, 75 miles to the southward, to points on the Santa Fé Railroad, and even to the mining districts around Prescott.

Canada

SQUAMISH, B. C.—A hydroelectric plant, it is reported, will be installed in Squamish by the government in connection with other extensive improvements here.

VANCOUVER, B. C.—Contracts have been awarded to the C. H. E. Williams Company, electrical contractors, for the installation of electrical equipment on twelve 1500-ton and ten 3200-ton schooners under construction by the Northern Construction Company, Ltd., of Vancouver and the New Westminster Construction & Engineering Company, Ltd.

ANCASTER, ONT.—The installation of a distribution system to supply hydroelectric power in Ancaster is under consideration. The cost is estimated at about $17,000.

CARLETON PLACE, ONT.—The City Council is considering the purchase of the local electric light plant, owned by H. Brown & Sons, to be owned and operated by the municipality.

TORONTO, ONT.—The City Council has adopted a by-law authorizing an expenditure of $650,000 for extensions to the hydroelectric system.

UXBRIDGE, ONT.—A by-law will soon be submitted to the ratepayers authorizing improvements to the local electric light plant, involving an expenditure of about $7,000.

Mexico

SANTA ROSALIA, MEX.—Arrangements, it is understood, are being made to complete the large hydroelectric and irrigation project of the Mexico Northern Power Company within the next few months. The work includes the construction of a large dam across the Conchos River at a point about 18 miles from Santa Posalia, the installation of a power plant to develop about 150,000 hp., the building of a system of canals and ditches, and reclaiming about 200,000 acres of valley lands by means of irrigation. Several millions dollars, it is stated, have already been expended on the project. J. W. Thompson is superintendent.

(Issued Dec. 3, 1918)

1,286,394. METHOD AND APPARATUS FOR ELECTRIC HEATING BY HIGH-FREQUENCY CURRENTS; Edwin F. Northrup, Princeton, N. J. App. filed Sept. 19, 1917. To transfer electric energy into a continuous mass by electromagnetic induction and there to convert the electric energy into thermal energy by means of high-frequency currents.

1,286,395. OSCILLATION-CURRENT METHOD AND APPARATUS; Edwin F. Northrup, Princeton, N. J. App. filed Nov. 25, 1916. To utilize the heating effect of electric currents having the natural frequency of a freely oscillating electric system from a condenser discharging through a gap.

1,286,403. AUTOMOBILE SIGNAL; Charles R. Piggins, Racine, Wis. App. filed June 2, 1916. May be swung out from the side of the automobile to indicate the intention of the drive to make a turn.

1,286,415. TORQUE REGULATOR; Forrest E. Ricketts, Baltimore, Md. App. filed May 25, 1911. To compensate for the increasing torque in an alternating-current meter where the torque varies as the square of the current.

1,286,418. OUTPUT INDICATOR; Harry D. Rohman, New York, N. Y. App. filed Dec. 1, 1915. Primarily for use on dynamos of the slipping-belt type, as employed in electric train lighting, heating and ventilating systems.

1,286,429. THERMO-ELECTRIC GENERATOR; Frank D. Shindel, Northampton, Pa. App. filed Oct. 29, 1915. The couples of dissimilar metal are heated and cooled to produce a current of maximum strength for an apparatus of minimum size.

1,286,466. WRAPPING MACHINE; Charles B. Whittelsey, Hartford, Conn. App. filed March 20, 1916. Has mechanism for applying to the surface of the wrapper a tearing device in the form of an adhesive tape.

1,286,498. ELECTRIC WATER HEATER; Robert P. Barnstead, Boston, Mass. App. filed May 6, 1918. As the water is turned on or off the heating device will have its current automatically cut in or out.

1,286,511. MAGNETIC PULLEY SEPARATOR; John P. Bethke, Milwaukee, Wis. App. filed Jan. 31, 1918. Used in connection with a conveyor belt to separate magnetic from non-magnetic material.

1,286,512. GAS-ENGINE PRIMER; Wilbert T. Bintliff, Plainfield, N. J. App. filed June 4, 1915. Is heated electrically and may be attached directly to the engine manifold or associated with the carburetor in such a manner that the vaporized liquid at the necessary temperature passes therefrom to the chamber wherein it is mixed in the air before entering into the cylinder.

1,286,576. THERMOSTATIC CIRCUIT CLOSER; Thomas B. Frean, Leonia Borough, N. J. App. filed March 17, 1913. For use with constant-temperature baths of the type designed for chemical laboratory ovens, bacteriological incubators and other similar apparatus.

1,286,577. PROCESS FOR MANUFACTURING GASES; Herbert F. Frueler, Walla Walla, Wash. App. filed June 6, 1916. Has particular reference to the production of carbon monoxide and hydrogen.

1,286,587. DIRECT-CURRENT APPARATUS; Charles W. Girvin, Philadelphia, Pa. App. filed Aug. 26, 1915. Adapted to operate in connection with currents of high potential.

1,286,590. PORTABLE ELECTRIC LANTERN; William Grether, Dayton, Ohio. App. filed June 27, 1918. Uses a storage battery and has an airtight and gas-proof reflector compartment.

1,286,592. ELECTRICAL CONNECTION; Ansel F. Gurney, Natick, Mass. App. filed Jan. 21, 1918. Particularly for use with the protective flexible armored cable commonly used for protecting electric wire in automobile.

1,286,596. METALLIC-FILAMENT LAMP; Herman J. Jaeger, Weehawken, N. J. App. filed Dec. 15, 1916. Dispenses with the glass rod or support and thereby greatly reduces the liability to blackening of the lamp.

1,286,604. FURNACE DOOR; Julius R. Hall, Oak Park, Ill. App. filed April 4, 1918. Equipped with an electrode holder which is durable and permits manipulation of the electrode in a desirable manner.

1,286,605. OUTLET-BOX FITTING; Oscar E. Hallstrom, Stratford, Conn. App. filed July 5, 1917. Adapted to be mounted in a one-gang outlet box, and through which both switched and unswitched connections may be established between the wires leading to the box.

Record of Electrical Patents

Notes on United States Patents

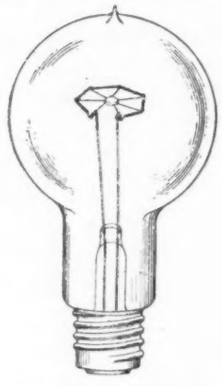
1,286,624. CLAMP FOR WIRES; George W. Henry, New York, N. Y. App. filed Nov. 18, 1915. Wire can be readily inserted and removed.

1,286,652. PROCESS FOR RECOVERING COPPER FROM ORES AND ORE PRODUCTS; Gustaf N. Kirsebom, Copenhagen, Denmark. App. filed Dec. 5, 1917. Consists in smelting a sulphide ore rich in copper with a roasted sulphide ore containing copper in the presence of silica and of a quantity of coke sufficient to effect the reduction of ferric oxide to ferrous oxide, the smelting operation being effected in a resistance-type electric furnace.

1,286,671. SYSTEM OF DISTRIBUTION; William H. Lieber, Milwaukee, Wis. App. filed July 21, 1915. Has particular relation to devices for regulating generators connected to supply variable loads.

1,286,705. PERMUTATION ELECTRIC SWITCH; Matthew E. Meskill, Jersey City, N. J. App. filed April 25, 1918. Has particular reference to switches or circuit breakers that are intended to provide means whereby an authorized person only may close the circuit.

1,286,750. DRY-CELL BATTERY; Herbert R. Palmer, Cleveland Heights, Ohio. App. filed Feb. 8, 1918. To increase the efficiency of a cell of the Leclanché type without materially increasing the volume or weight.



1,286,596—Metallic-Filament Lamp

1,286,751. DEVICE FOR INDICATING THE FAULTY OPERATION OF IGNITION VALVES AND CARBURETORS OF INTERNAL-COMBUSTION ENGINES; Otto T. Papke, Joliet, Ill. App. filed March 26, 1918. Each and all of the circuits leading to the spark plugs may be opened or short-circuited by grounding.

1,286,782. CORE CONSTRUCTION FOR ELECTRICAL APPARATUS; George L. Ringland, Norwood, Ohio. App. filed Feb. 19, 1917. Provides for the required mechanical strength and efficient ventilation of the core.

1,286,794. ELECTRIC FURNACE; Olof Sahlin, London, England. App. filed May 1, 1918. Electrodes are arranged so that the arc is either formed between the two electrodes or between the upper electrode and the bath of metal or other conducting material.

1,286,795. MEANS FOR IMPROVING THE COMMUTATION IN ROTARY RECTIFIERS; Henry K. Sandell, Chicago, Ill. App. filed May 29, 1916. Commutation effected in a substantially sparkless manner, and the necessity for minute exactness as to the time of breaking between the brush and its segment is obviated.

1,286,800. BATTERY-LIGHTING OUTFIT; Walter B. Schulte, Madison, Wis. App. filed June 25, 1918. The lamp carrier may be fitted on the head, arm or other portion of the body of the user, and the hand lamp inserted in a conveniently located pocket, leaving both hands free.

1,286,803. HYDROCARBON MOTOR; Herman G. C. Schwarze, Detroit, Mich. App. filed Nov. 20, 1915. To provide an ignition system for high-speed multi-cylinder internal-combustion engines.

1,286,806. LOCKING SWITCH; Edson O. Sessions, Chicago, Ill. App. filed June 23, 1916. Particularly for use with alternating currents of large volume.

1,286,815. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, Pa. App. filed July 12, 1915. Means provided for materially increasing the range of the time element of definite time-limit relays.

1,286,841. ELECTROPNEUMATIC BRAKE; Walter V. Turner, Wilkinsburg, Pa. App. filed Feb. 20, 1918. When an emergency application of the brakes is made the service magnet valve, even if stuck in an open position, cannot supply fluid to the brake pipe.

1,286,842. ELECTROFLUID-PRESSURE BRAKE; Walter V. Turner, Wilkinsburg, Pa. App. filed Feb. 23, 1918. Number of train circuits required is reduced by providing means for controlling both the application and the release of the brakes through common train circuits.

1,286,844. ELECTROLYTIC CELL; Fayette D. Vorce, Sandwich, Ontario, Canada. App. filed April 2, 1918. Provides readily assembled and disassembled construction.

1,286,850. CURRENT-REGULATING APPARATUS; Julius B. Wantz, Chicago, Ill. App. filed July 24, 1916. For use under conditions requiring relatively close regulation of the current throughout relatively wide variations.

1,286,855. SELECTOR SWITCH; Harry G. Webster, Chicago, Ill. App. filed Sept. 4, 1915. The circuit terminals may be relatively rigid contact pieces assembled in removable banks relatively distant from the actuating bars or shafts.

1,286,882. ELECTRIC TRANSLATING APPARATUS; Peter C. Hewitt, Ringwood Manor, N. J. App. filed April 16, 1918. To reduce the necessary voltage for passing current to a far lower limit.

1,286,885. TELEPHONE RECEIVER; William H. Riess, Cincinnati, Ohio. App. filed Jan. 29, 1917. When receiver is laid down it will always "right itself" or tip so that mouth or trumpet end is exposed or open, permitting notice to be given to the user that his receiver is off hook.

(Issued Dec. 10, 1918)

1,286,899. SYSTEM OF POWER TRANSMISSION; Stanley B. Arnold, Chicago, Ill. App. filed Nov. 8, 1916. Relates to an electric generator comprising armature and field members and acting as a clutching, releasing, starting and stopping medium between the prime mover and its load.

1,286,917. TELEGRAPH SYSTEM; John H. Bell, East Orange, N. J. App. filed July 12, 1917. Relates to telegraph transmitting apparatus and systems wherein current changes imparted over a single-line conductor may be readily recorded either in code or in printed form at a properly equipped receiving station.

1,286,919. SEPARABLE ATTACHMENT PLUG; Reuben B. Benjamin, Chicago, Ill. App. filed Dec. 9, 1914. Comprises an insertible member adapted to be screwed into a lamp socket or the like and a binding terminal-carrying member which is separably connected to the insertible member.

1,286,959. PRINTING TELEGRAPH SYSTEM; Amos F. Dixon, Newark, N. J. App. filed May 24, 1916. Apparatus for testing automatic transmitters and selecting mechanisms, such as those employed in printing telegraphs.

1,286,960. ELECTRIC MOTOR-CONTROL SYSTEM; Samuel R. Dodds, Wilkinsburg, Pa. App. filed July 1, 1916. A master controller primarily operates a subsidiary shunt circuit to close the switch for the main current, but is thereafter relieved of the duty of maintaining such switch closed.

1,286,961. CIRCUIT CONNECTOR; Harry A. Douglass, Bronson, Mich. App. filed April 4, 1917. Is of particular service when employed in the manufacture of headlights, tail lights, etc.

1,286,965. MAGNET CORD; Gustaf W. Elmen, Bogota, N. J. App. filed April 6, 1916. Particularly useful in connection with cores for loading coils for telephone circuits.